

MARCH 1946 — FIFTY-SECOND YEAR

MACHINERY



TWIN PRECISION

NORMA-HOFFMANN BALL BEARINGS

Rugged—thoroughly dependable for carrying thrust and radial loads

Feature all the precision, the fineness, the friction-free smoothness for every load, speed and duty. Sizes as small as $\frac{1}{8}$ of an inch, and up to 22-1/2" in bore

NORMA-HOFFMANN ROLLER BEARINGS

Extraordinary in their ability to absorb punishment

Short, cylindrical roller design — heavy duty bronze retainer — superb workmanship and finish — lowest possible coefficient of friction under heavy load

NORMA-HOFFMANN BEARINGS CORPORATION, STAMFORD, CONN. — FOUNDED 1911
BALL, ROLLER AND THRUST BEARINGS

Field Offices: NEW YORK • CHICAGO • CLEVELAND • CINCINNATI • PITTSBURGH • DETROIT • LOS ANGELES • SAN FRANCISCO • SEATTLE, WASH.



WHY THE OPERATOR DOESN'T BELONG IN THIS PICTURE

Another example of how Heald engineering helps you to cut costs—automatically!

In showing you this close-up of the Heald No. 81 Centerless Grinder, we've purposely left the operator out of the picture. Because in any internal grinding operation that requires both fine precision and high speed production, the operator is the *least important factor* when you use the Heald 81 Centerless.

Operation of this machine involves nothing more than placing the work in loading chutes. The machine does everything else. Loading, unloading, and even size control are *completely automatic*. One operator—and an unskilled one at that—can handle as many as six machines at once.

The Heald 81 Centerless will give you greater accuracy, too, with fewer rejects. Perfect concentricity is assured by the Centerless method of generating the bore from the outside diameter. Hole size is automatically held to tolerances of ten-thousandths by the Heald Size-Matic or Gage-Matic method.

On all types of work having a finished cylindrical O.D. up to 4½ inches—with straight, tapered, interrupted, open or blind holes—the Heald 81 Centerless will do the job faster, more accurately, and with less supervision.

This is typical of the kind of engineering that can easily mean the

difference between profit and loss on any production line, especially in these days when so many other factors are beyond your control. At no obligation, a Heald engineer will gladly study your problem to help you get better production at lower cost. For details, write: The HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

*means finer precision
... Faster production*

INTERNAL AND SURFACE GRINDING MACHINES • BORE-MATIC PRECISION FINISHING MACHINES

MACHINERY

MARCH, 1946

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The leading article in April MACHINERY will deal with the Cold-Bending of Pipe, Tubes, and Other Metal Shapes on Automatic and Manually Operated Machines, outlining the application of both ram type and rotary type bending machines. This is the first article in a series on this subject; subsequent articles will cover the tools used for bending, the hydraulic circuit employed in hydraulically operated machines, and suggestions for engineers in designing for bending.

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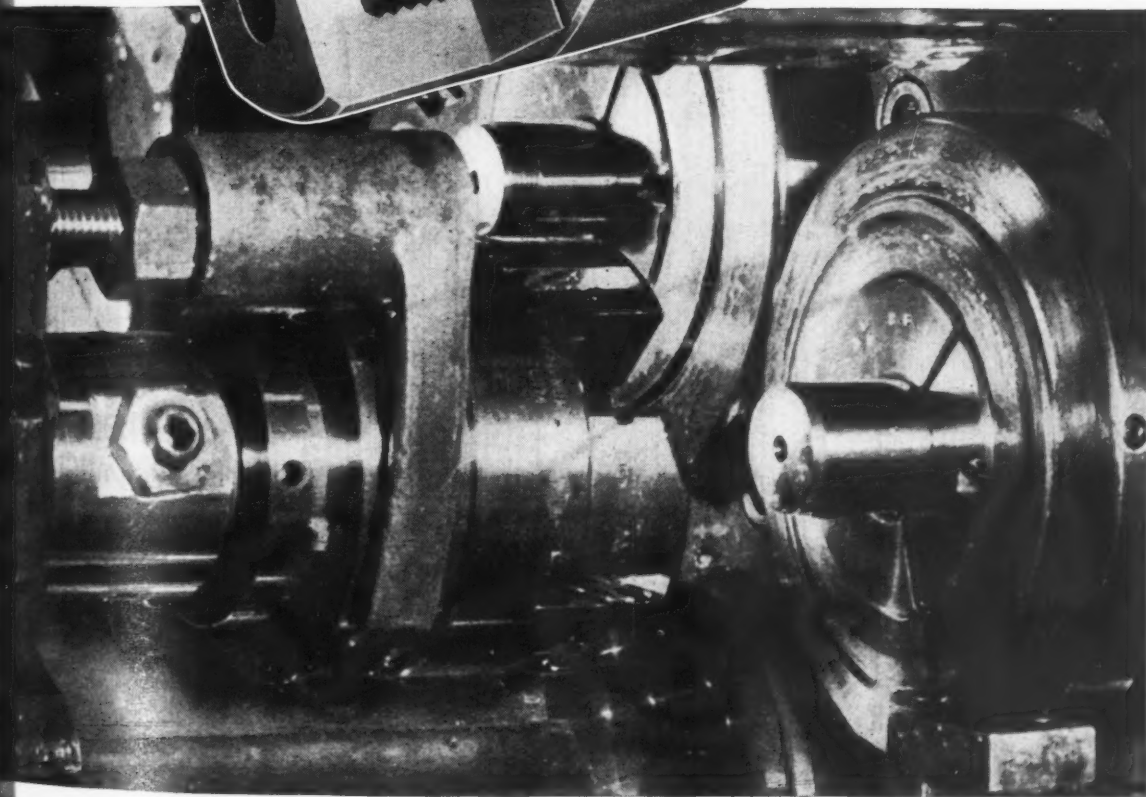
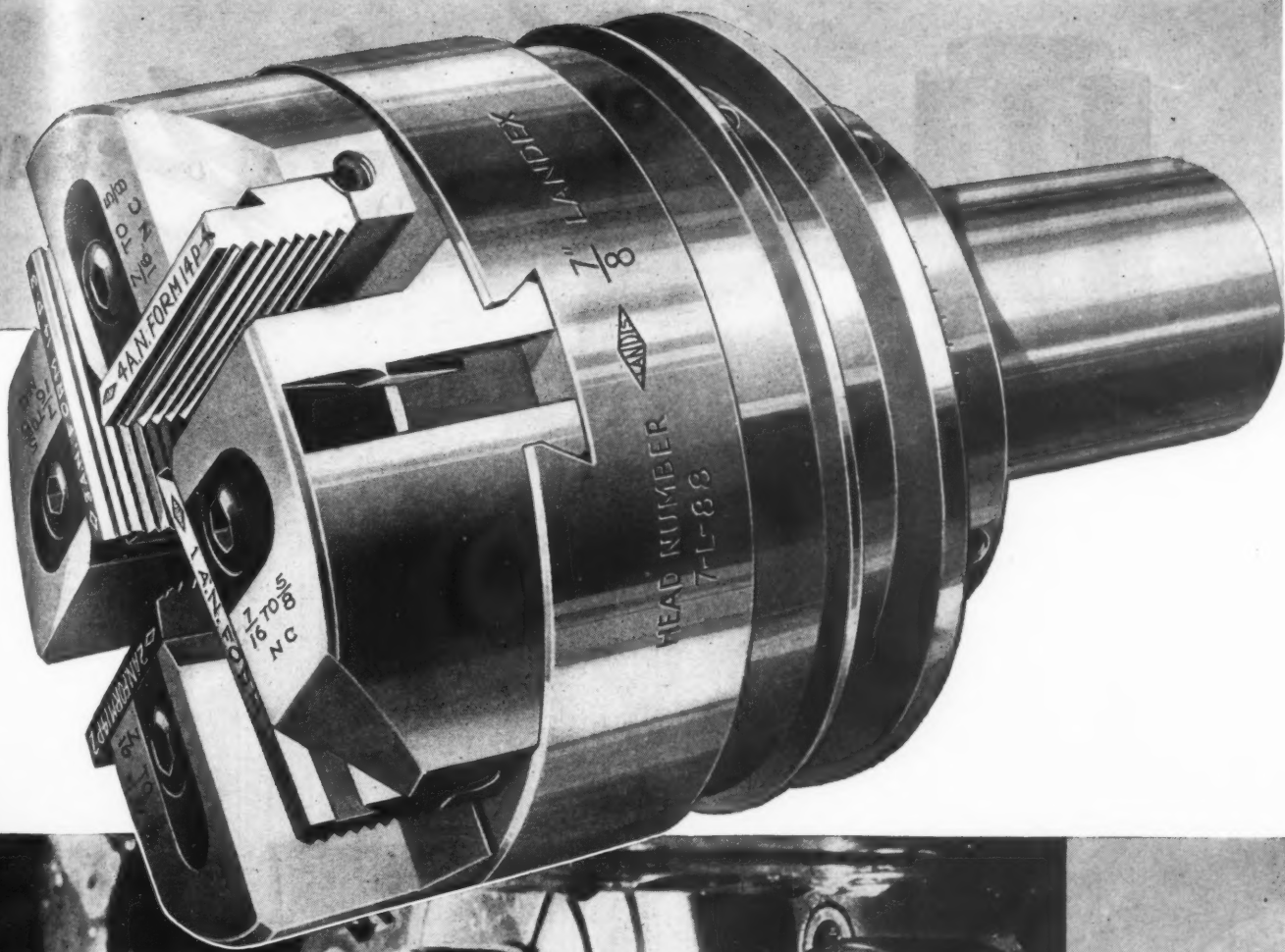
Solving Reconversion Threading Problems **The LANDEX Die Head**

The Landex Hardened and Ground Die Head, as illustrated, was used extensively during the past five years in the production of munitions and other ordnance parts.

With reconversion Landex Die Heads and other LANDIS Thread Cutting Machines and Die Heads will just as efficiently and economically produce your threaded components to the fine accuracy and high production requirements of the new peace-time schedules.

Write for Bulletin No. F-80

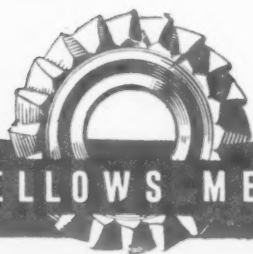
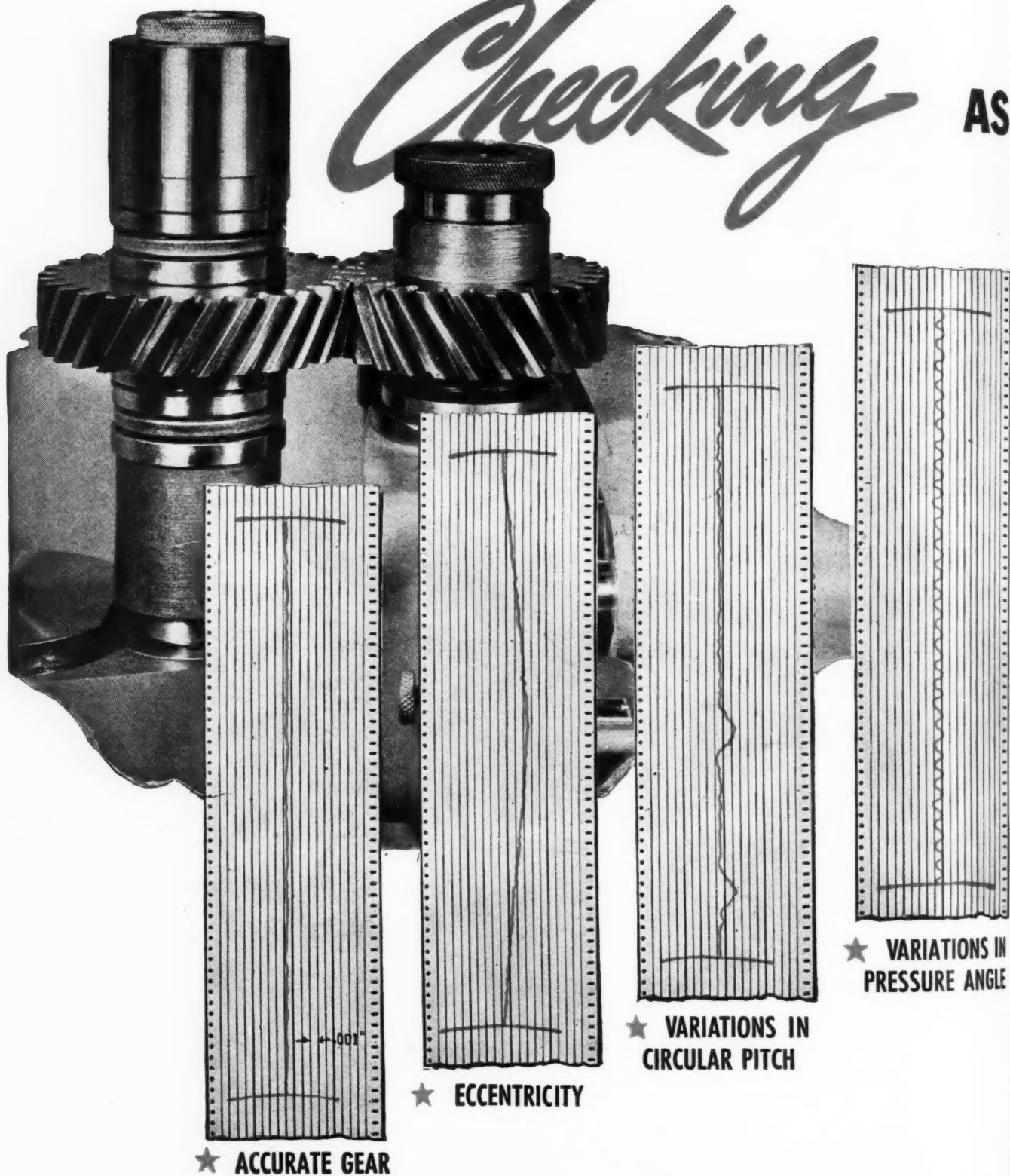




MACHINE CO. WAYNESBORO
PENNA. U.S.A.

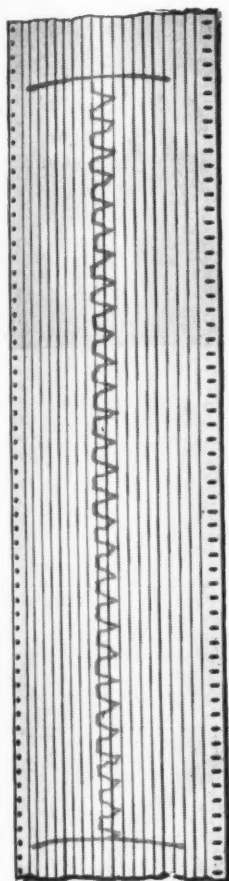
Checking

AS

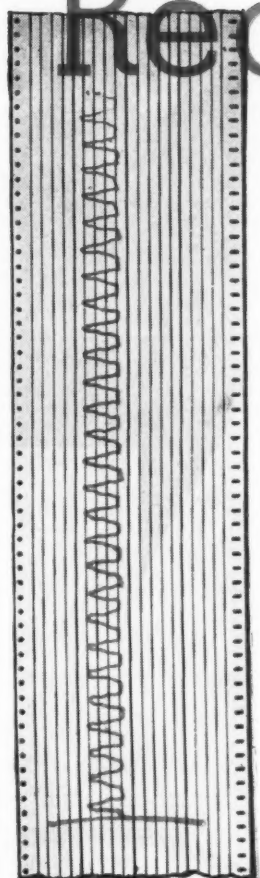


THE FELLOWS METHOD...MACHINES AND TOOLS FOR

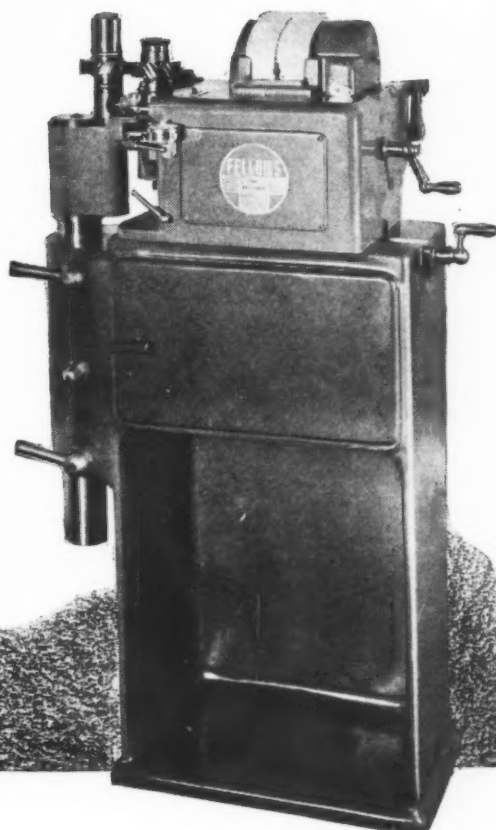
ONLY A Red Liner CAN DO IT...



★ FILLET
INTERFERENCE



★ LACK ON CON-
TINUOUS ACTION



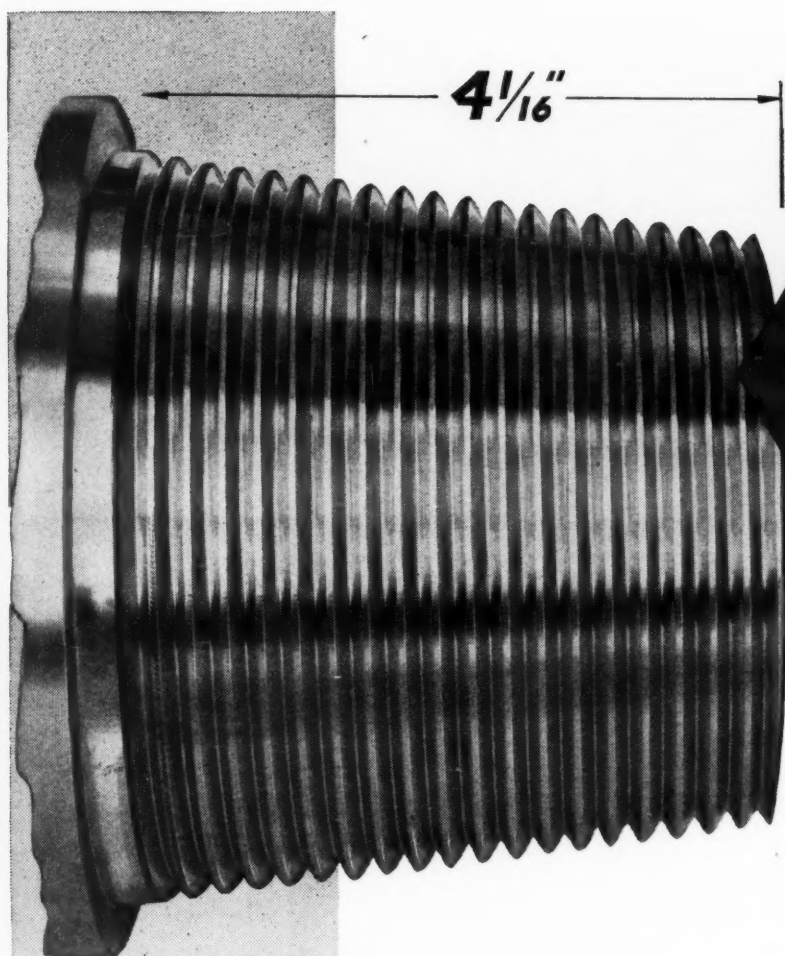
This checking instrument's recording of all errors in combination best serves manufacturing requirements, since it most nearly approaches actual gear operating conditions. Each error produces a characteristic deviation from a straight line. These errors, however, are easily identified and their magnitude and loca-

tion determined. Ask the Fellows sales engineer, or write for the Red Liner bulletin.

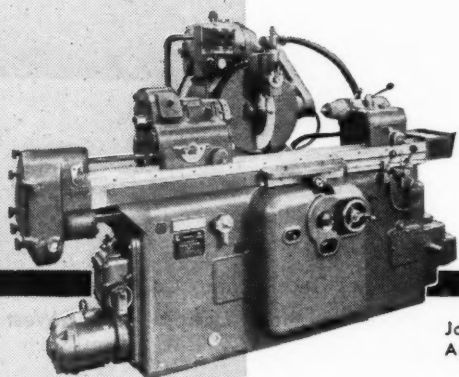
Address: The Fellows Gear Shaper Co., Springfield, Vermont—or 616 Fisher Bldg., Detroit—or 640 West Town Office Bldg., Chicago.

Fellows

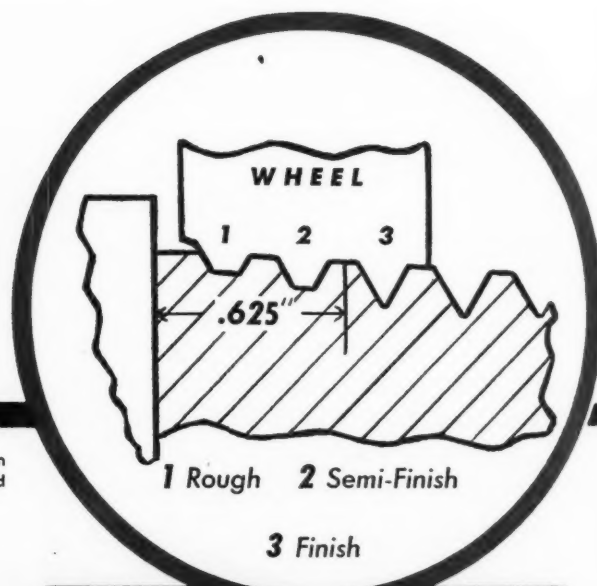
ALL OPERATIONS FROM BLANK TO FINISHED GEAR



**GROUND
ONE
IN**



Jones & Lamson
Automatic Thread
Grinder



For shorter threads, other multi-rib wheel forms can be used—the full rib type that requires only one complete revolution of the work, and the alternate rib type that requires two complete revolutions. Our engineers can determine the most advantageous method for your needs.

FROM THE SOLID WITH PASS OF THE WHEEL, LESS THAN 4 MINUTES

This is a typical example of multi-rib wheel performance on tough, heat-treated steel forgings with Jones & Lamson Automatic Thread Grinders.

The 5-pitch, special form API thread, with a taper of 3 inches per foot, and a mean outside diameter of 4.117", is ground in less than 4 minutes cutting time with a three-rib wheel, one rib roughing, one semi-finishing and the third finishing. More than one pound of metal is removed.

Rapid metal removal, accuracy of form and quality of finish are assured by the FULLY AUTOMATIC WORK CYCLE of Jones & Lamson Automatic Thread Grinders, which includes AUTOMATIC DIAMOND DRESSING OF THE WHEEL, automatic compensation for amount dressed off the wheel, and automatic sizing.

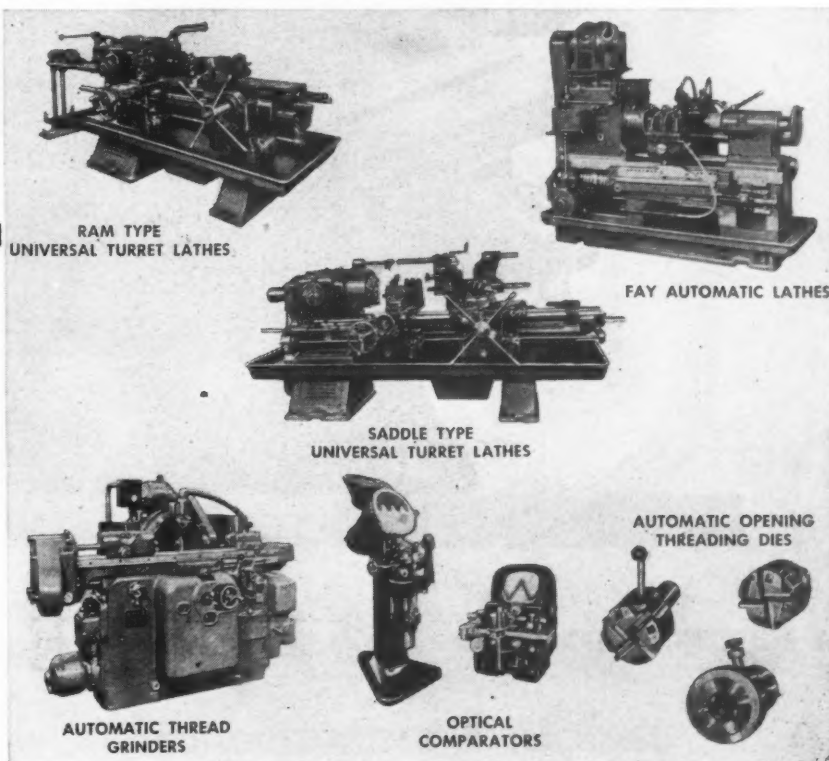
Why not phone today for one of our engineers to tell you more about production threading with Jones & Lamson Automatic Thread Grinders.

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.



Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.



New Attachment

FOR CINCINNATI NO. 2 CUTTER SHARPENER

GRINDS ACCURATE RADIUS ON CUTTER TEETH

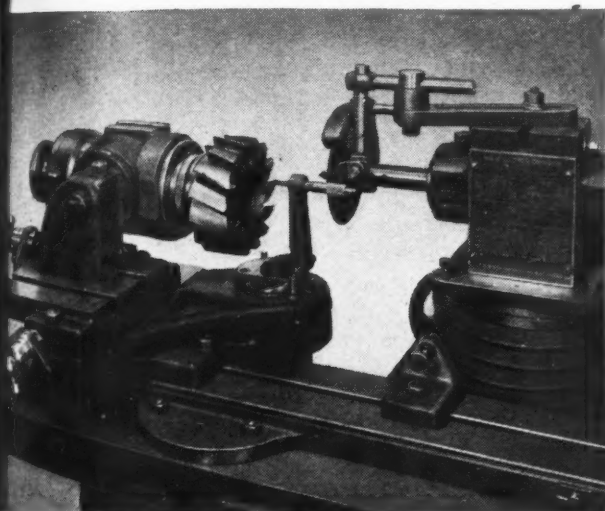


THE CINCINNATI

MILLING MACHINES

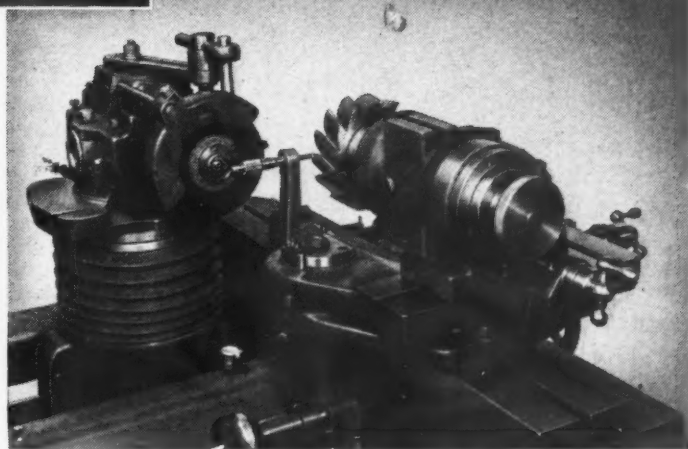
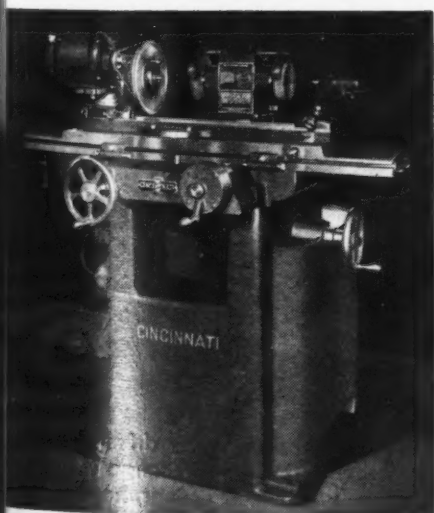
● In the illustration on the opposite page a CINCINNATI No. 2 Tool and Cutter Sharpener, equipped with a CINCINNATI No. 2 Radius Grinding Attachment, is grinding a 90° radius on the cutter teeth of a 6" shell end mill. This device is suitable for grinding radii up to 1", either as a separate operation, or in combination with the diameter and/or face of the teeth on cutters from 4" to 12" diameter.

The setup illustrated, from the micrometer setting gage to the dial indicated radius adjustments and smooth anti-friction trunion, has the potential to produce a high quality ground radius. It is recommended for shops where flat surfaces must be milled square with each other, with a radius fillet between them. Complete information on this attachment may be obtained by writing for Catalog M-1442.



← Micrometer gage set for longitudinal adjustment to desired radius.

Micrometer gage set for cross adjustment to desired radius.



← Left: CINCINNATI No. 2 Cutter and Tool Grinder. For complete specifications, write for Catalog No. M-962-3. Sweet's Catalog File contains a brief description.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES

CUTTER SHARPENING MACHINES

CINCINNATI CENTERLESS



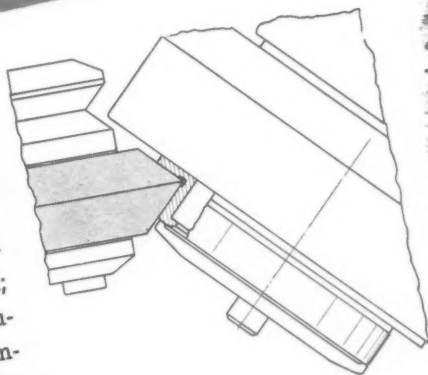
CINCINNATI No. 2 Centerless, with special motor driven chucking unit, replacing upper and lower slides. The speed change unit, ordinarily employed to change the regulating wheel speeds, has been omitted since its function is taken over by a variable voltage headstock motor which provides work speeds ranging from 40 to 300 rpm.

CINCINNATI

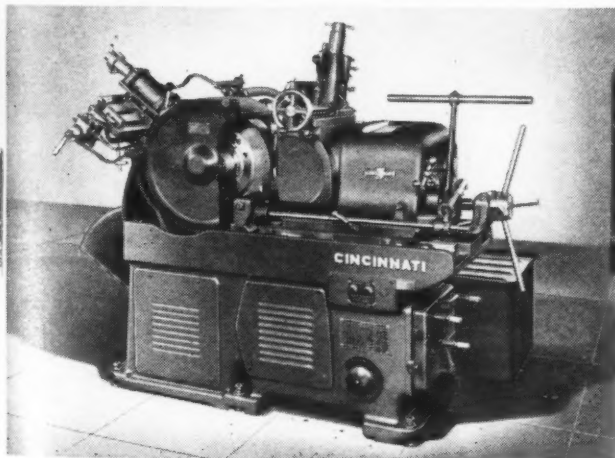
CENTER TYPE GRINDING MACHINES

SS with CHUCKING UNIT . . . grinds flange and diameter *at the same time!*

● Here's another example of Cincinnati Engineering Service. A CINCINNATI No. 2 Centerless, tailored to suit the job, is grinding the flange and diameter on a family of bearing race retainers. Special equipment includes: FILMATIC Bearing Live Spindle Headstock; Air Operated Rapid Advance and Retraction unit to move headstock; grinding wheel Hydraulic Truing Fixture for truing two faces of wheel at 45° angle. The setup employs the chucking grinder principle. ¶ The CINCINNATI No. 2 Centerless Grinder is the ideal basic machine for modification to a single purpose setup similar to the one illustrated. Perhaps this, or a similar application, may have a place in your manufacturing processes. Why not talk it over with the Cincinnati Application Engineers? They may be able to work out a more economical method of handling your grinding operations.



Sketch of grinding wheel and one of the larger parts ground on the setup illustrated.



CINCINNATI No. 2 Centerless Grinder. Write for Catalog G-456-3, which contains complete specifications. Sweet's Catalog File gives a brief description of this machine.

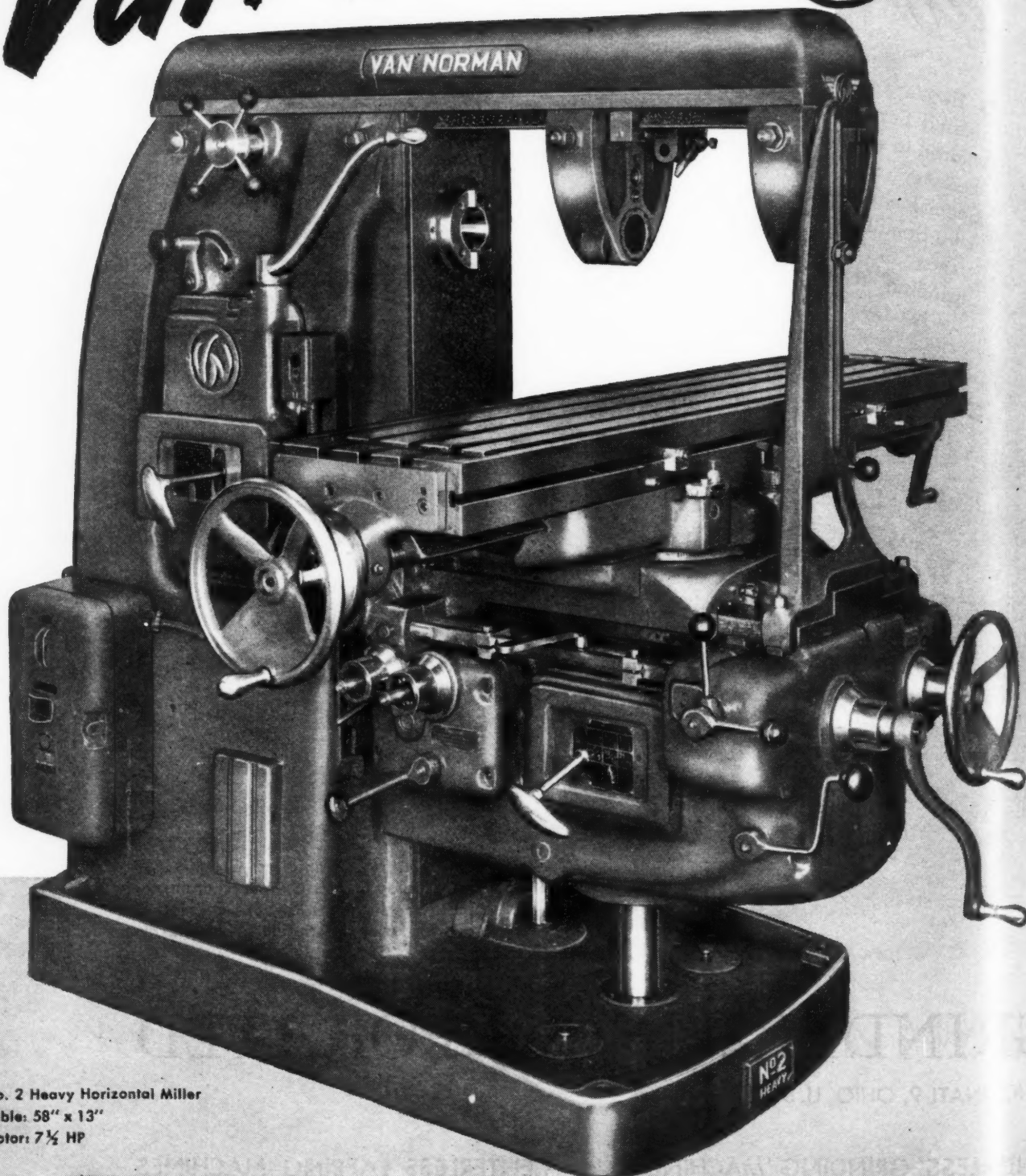
TI GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

HINES CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

NEW

Van Norman

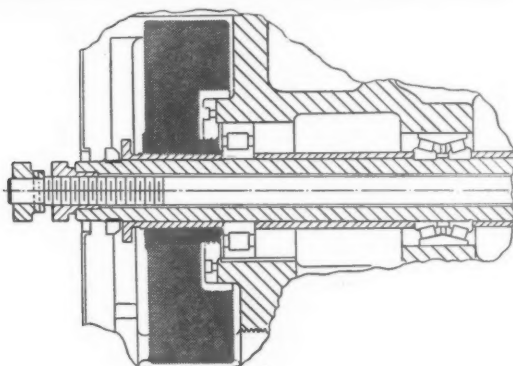


No. 2 Heavy Horizontal Miller
Table: 58" x 13"
Motor: 7½ HP

No. 2 Heavy

HORIZONTAL MILLING MACHINE

BUILT-IN FLYWHEEL



Improves Cutability...Increases Operator and Machine Output

The new Van Norman No. 2 Heavy Miller is especially designed to handle heavy milling operations faster, easier, at reduced costs.

Among its outstanding features is the new exclusive Van Norman spindle design which incorporates a heavy flywheel, mounted on the spindle inside the column, assuring uniform transmission of power to cutter. It improves cutability and assures a smooth finish on the work.

For ease of operating convenience, the No. 2 heavy has front and rear directional control of all power feeds. Actuated in the direction of desired table, saddle, knee movement, they add to operator safety. Rapid traverse is also provided with front and rear controls.

In addition front and rear manual hand feeds enable the operator to line up the cut from either location providing complete visibility in arranging the set-up. Exclusive Van Norman single lever speed and feed selectors provide quick changes of 18 speeds and 18 feeds.

Such construction features as massive column and overarm, large hardened alloy steel gears, hardened multi-splined shafts, taper roller bearings, automatic lubrication and large diameter feed screws assure long life and accurate performance.

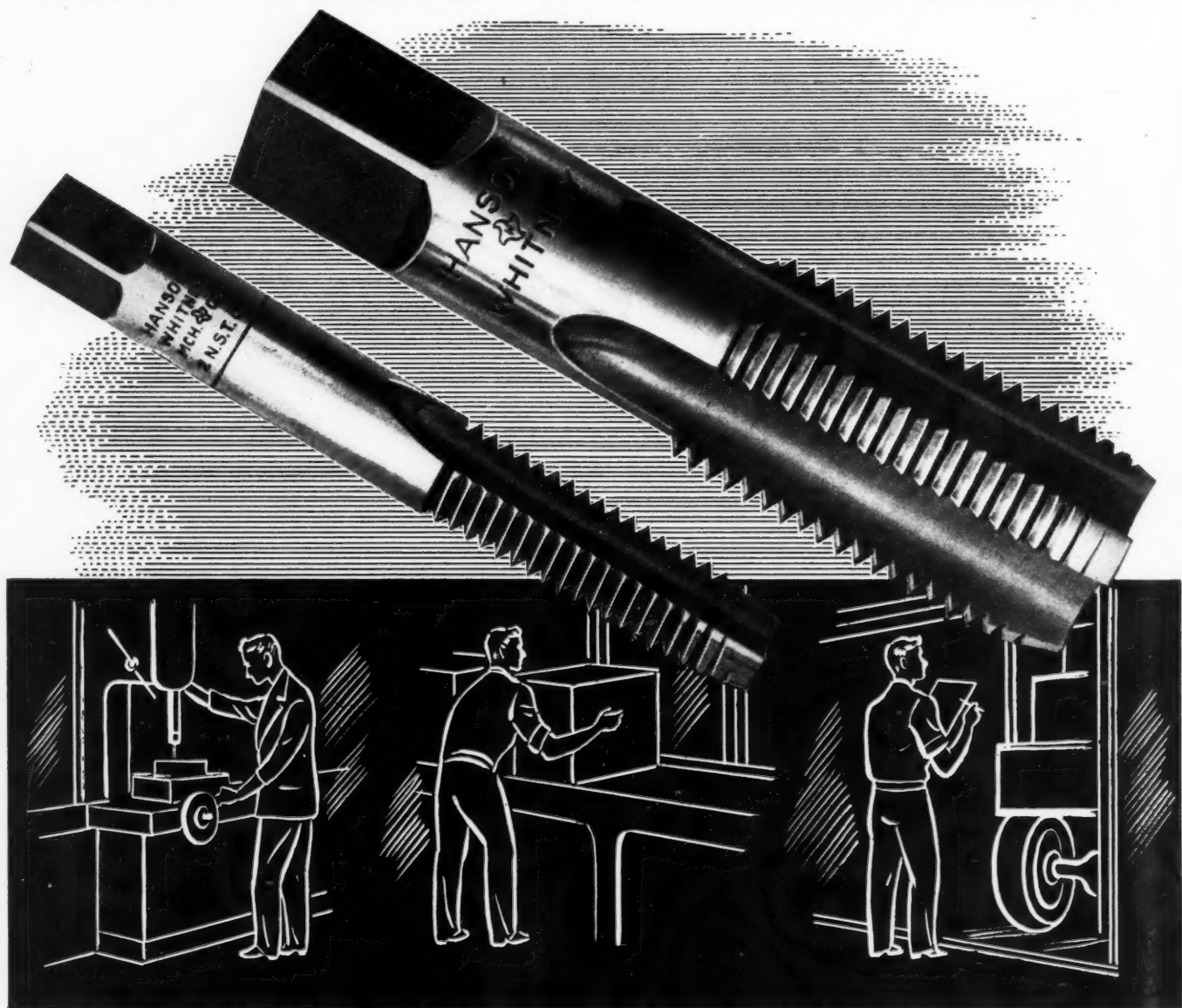
The Van Norman No. 2 Heavy Horizontal Milling Machine is available with plain or universal saddle. Write for complete information, today.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

Sets New Standards

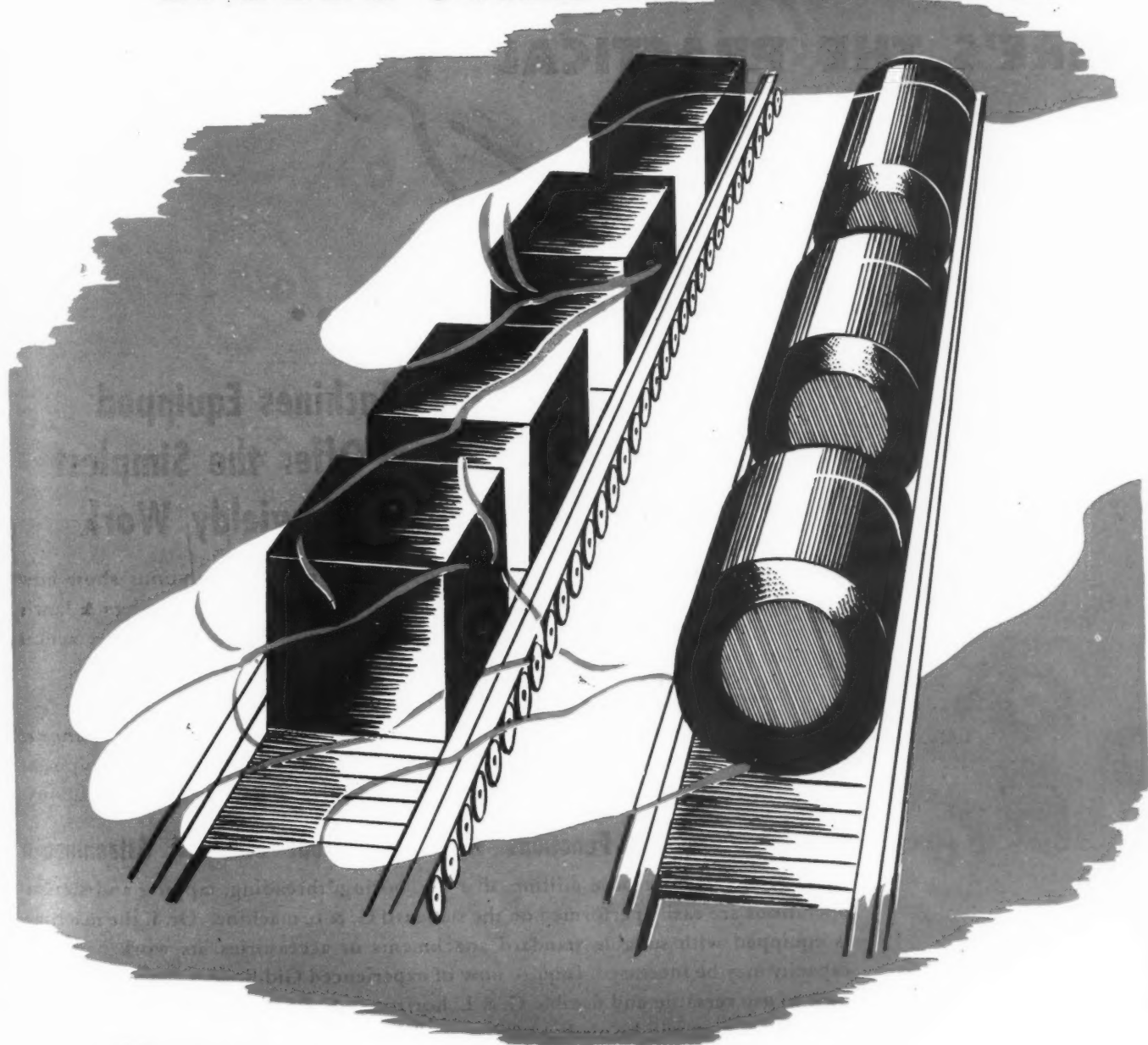


Highest precision . . . extreme accuracy . . . increased speed of thread production . . . are but a few of the new standards set up by the H-W Thread Milling Process employing multiple cutters. Threads all lengths within the machine's capacity in a single revolution.

Users of H-W Taps are assured greater dependability, longer runs between grinds, speeded-up thread production by the "Hanson Process" . . . the exclusive method of finishing after hardening. There's an H-W Tap for every tapping need.

for Post War Era...

SPEEDS PRODUCTION LINES



Hanson Whitney

M A C H I N E C O M P A N Y

M A R T F O R D • C O N N E C T I C U T

MACHINERY, March, 1946—15

HERE'S THE PRACTICAL

TO DIFFICULT

TURNING OPERATIONS...

Solution

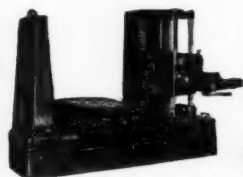
**G. & L. Horizontal Boring Machines Equipped
with Standard Attachments Offer the Simplest
Overall Means of Machining Unwieldy Work**

Hard-to-approach jobs such as these stub trunnion turning operations show how one class of difficult work is handled more easily and faster on Giddings & Lewis Horizontal Boring Machines. This is but a single example of the many practical machining possibilities open to the user of G. & L. equipment.

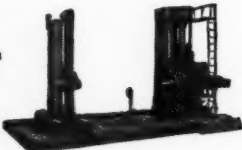
Continuous Feed Facing Heads accurately turn the trunnions on both the 33" diameter suction elbow and on the welded slide mechanism. *Dimensional tolerances and alignments are held to required specifications.* On no other type of equipment can such unwieldy, awkward pieces be machined with equal speed and facility.

Additional Machine Functions With or Without Standard Attachments

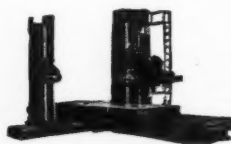
Extensive general-purpose milling, drilling, boring, threading, tapping and similar operations are easily performed on the standard G. & L. machine. Or, if the machine is equipped with suitable standard attachments or accessories, its work handling capacity may be increased. Inquire now of experienced Giddings & Lewis engineers how to use versatile and flexible G. & L. horizontal boring machines to your advantage. These men will be glad to offer practical and profitable suggestions for simplifying your general and specific machining problems.



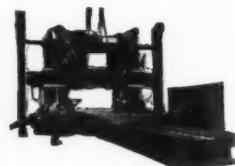
G. & L. Table Type
Machine



G. & L. Floor Type
Machine

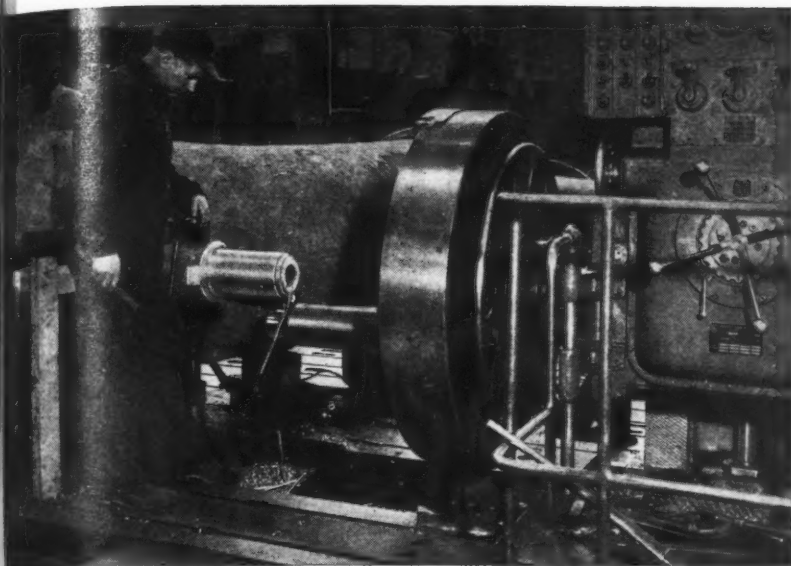


G. & L. Planer Type
Machine



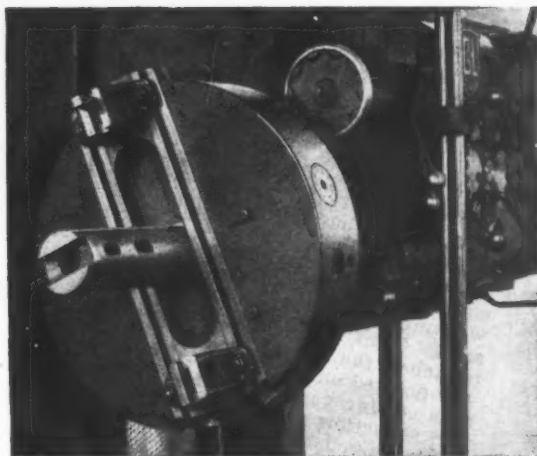
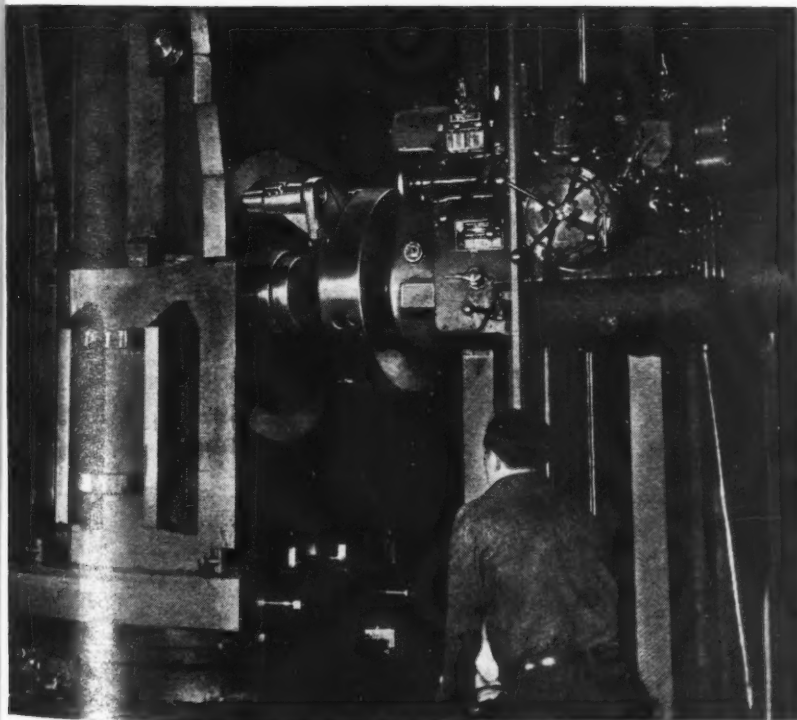
G. & L. Multiple
Head Type Machine

GIDDINGS & LEWIS MACHINE TOOL CO.



Stub trunnion on a 33" diameter suction elbow being turned on a G. & L. floor type machine. Note the simple method of mounting the odd shaped workpiece and the use of the Continuous Feed Facing Head Attachment.

Facing and turning operations performed on a G. & L. table type machine with a Continuous Feed Facing Head. Welded slide mechanism is mounted on a rotary table to facilitate indexing.



Standard Continuous Feed Facing Head Attachment for use on table, floor or planer type machines.

CONTINUOUS FEED FACING HEAD

This attachment is designed to simplify and speed the production of numerous difficult machining jobs. It is used for internal and external turning operations, for internal boring, grooving, recessing and threading. It is also used to perform a variety of rough and finish facing operations, and back facing operations when telescopic tools are employed. With this highly flexible attachment it is possible and practical to combine machining cuts, thus lowering production time. The working range of your Giddings & Lewis Horizontal Boring Machine is materially increased through its use.

Note: Photographs through the courtesy of Danly Machine Specialties, Inc., Chicago, Illinois and Joshua Hendy Iron Works, Sunnyvale, California.

Valuable
FIELD PRODUCTION FACTS
will point the way to improved machining methods. Write today for your FREE file of actual case histories as presented in G. & L. Production Data Folder MA-36.

140 Doty Street • Fond du Lac, Wis.

The June 1945 issue of *Machinery* today had named Tracy as president, climaxing six years of active participation in the organization for the young Cincinnati businessman.

The new executive, whose career was interrupted by four years' service with the U. S. Army Air Corps,

before being elected to the presidency.

In his remarks to the members following the election, he pledged full efforts in behalf of the organization and its ideals.

law and order.

In the oil workers' union quite an admission.

85% OF ALL METAL-WORKING JOBS COVERED BY NEW CUTTING FLUID!

CINCINNATI—From the research laboratories of the world's largest machine tool builders comes news of a revolutionary cutting fluid. Named CIMCOOL, the new product covers eighty-five per cent of all metal-working operations requiring coolants. CIMCOOL most nearly approaches the ideal cutting fluid, it was pointed out, because it combines high cooling capacity and high friction reduction to a degree never before attained. Unique physical and chemical properties are responsible for the success of CIMCOOL, already tested on the production line.

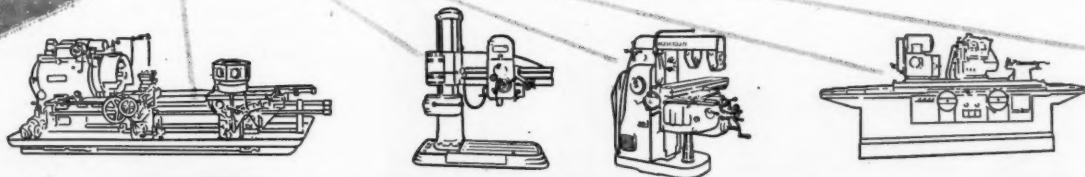
lines of many nationally-known manufacturers. Besides winning the approval of executives, CIMCOOL is also acclaimed by machine operators for its cleanliness and safety factors.

Need for High Efficiency Cited

WASHINGTON—American industry must reach a new high in production efficiency to meet the challenge of post-war competition, a spokesman for the nation's manufacturers declared today. "Our country," he said, "must produce the best possible goods at the lowest possible cost to meet public demands." Plant executives, throughout industry, must acknowledge this situation if they are to enjoy prosperity.

The group will meet tomorrow in its Main Street clubrooms to nominate committees and formulate plans for the coming campaign, the chairman stated. Committees will be organized to study various aspects of the problem.

It's big news for production men when a new product appears to help them meet the challenge of peak production efficiency! *And that product is here!* It's CIMCOOL, the multi-purpose cutting fluid offering you the lowest unit cutting fluid cost on record! You can translate this welcome news in the coolant field to still better news on the production line. Just **SPECIFY CIMCOOL!**



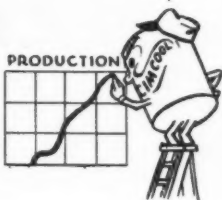
DIVISION OF



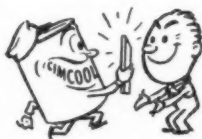
CIMCO

For **HIGH** Production Efficiency—For **LOW** Unit Cutting Fluid Cost

CIMCOOL helps increase production rates. Increased cooling capacity permits higher cutting speeds and feeds. Grinding wheels cut more freely. Low surface tension allows small chips and grit to settle out rapidly.



CIMCOOL helps increase tool life. Chemical lubricity reduces tool wear. Tools are kept cool to touch. Increased wetting action permits greater penetration between tool and chip.



CIMCOOL reduces downtime on machines. Fewer tool changes and fewer changes of cutting fluid are necessary. Pump and supply lines are kept clean. No spoilage.



CIMCOOL facilitates accuracy. Freer cutting reduces pressure. Uniform temperature is maintained on work and on machine. Dirt does not stick to work or gages, permitting faster, more accurate gaging.



CIMCOOL is tops with operators. It restricts bacterial growth, does not contain animal or vegetable oils subject to rancidity, and is not a skin irritant. Smoke, objectionable odors and hot chips are eliminated.



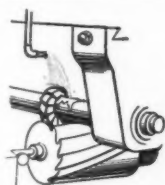
CIMCOOL is safest. Fire hazards are eliminated. Absence of slippery film on operator's hands, machine controls, work and floor reduces danger of accidents. Restriction of bacterial growth limits risk of infection.



CIMCOOL contains a rust inhibitor good for the life of the fluid for protection of machine and work. It does not contain any chromates or highly alkaline components which may be irritating.



CIMCOOL is applicable to 85% of all metal-working operations requiring cutting fluids. It replaces all water emulsions and all but very highly compounded specialty oils for selected jobs.



A case in point

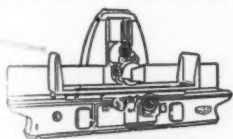
The Staples Tool & Engineering Company of Cincinnati have replaced a conventional sulphur base cutting oil on milling machines with

CIMCOOL diluted in 40 parts of water. They are

using both high speed steel and carbide form cutters milling flutes and tangs on milling cutter and reamer bodies made from carburized nickel-chrome-moly steel. They report that feeds and speeds were increased 10%, cutter life was increased 300%, and operator's satisfaction was increased immeasurably because of the coolness, cleanliness, and freedom from smoke and odor while using CIMCOOL.

THE CINCINNATI MILLING MACHINE COMPANY Cincinnati 9, Ohio, U.S.A.

The Multi-Purpose Cutting Fluid



O O L

Check • Clip • Mail

Manager, CIMCOOL Division M-3
Cincinnati Milling Machine Co.
Cincinnati 9, Ohio, U.S.A.

____ Please send me a copy of "What Is Cimcool?"

____ Please have sales representative call.

Name _____

Company _____

City _____ State _____

CATALOG VIEWS OF EFFICIENT

COIL

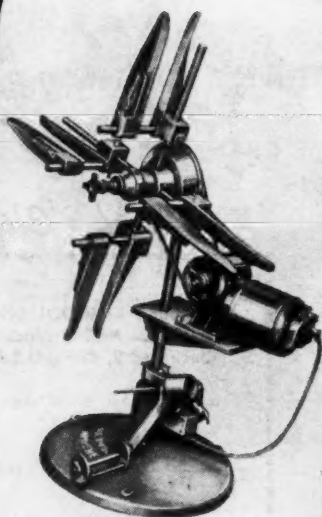
1
No. SR-0
U. S.
Plain
Stock
Reel
(Vertical Type)



2
No. SR-1
U. S.
Plain
Stock
Reel
(Vertical Type)



3
No. AR-1
U. S.
Automatic
Stock
Reel
(Vertical
Type)



U. S. TOOL COMPANY, INC.,

- 1** No. SR-0 U. S. PLAIN STOCK REEL (VERTICAL TYPE). For handling light coils weighing up to 100 lbs., with O.D. up to 12"; maximum width of material 1½".
- 2** No. SR-1 U. S. PLAIN STOCK REEL (VERTICAL TYPE). For heavier coils weighing up to approximately 200 lbs., with O.D. up to 36"; maximum width of material 4".
- 3** No. AR-1 U. S. AUTOMATIC STOCK REEL (VERTICAL TYPE). With motor and mercury switch control. This Reel suitable for handling coils up to 300 lbs., with O.D. up to 36"; maximum width of material 5¼".
- 4** No. ACR-2 U. S. AUTOMATIC CENTRALIZING STOCK REEL (VERTICAL TYPE). Similar to the AR-1 except for the addition of the centralizing feature which permits the quick adjustment of the core diameter. This Reel can handle 400 lb. coils with O.D. up to 38"; maximum width of material 6".
- 5** No. AR-10 SPECIAL U. S. AUTOMATIC STOCK REEL (HORIZONTAL TYPE). For holding coils of round wire or flat stock that is to be fed in a vertical position. This Reel can handle 500 lb. coils with O.D. up to 46"; maximum width of material 12".
- 6** No. CC-2-12 U. S. AUTOMATIC COIL CRADLE. For handling heavier coils weighing 500 lbs. and over. Maximum width of material 12". This unit is equipped with hardened ground feed rolls for automatically uncoiling the material.

L HANDLING EQUIPMENT

Many different types of parts are now being fabricated from Coil Stock in power presses and automatic stamping and forming machines (such as the U. S. Multi Slide Machine, etc.). On this type of work, efficient coil handling

equipment plays an important part in the overall economy of the set-up. The illustrations appearing in this advertisement show a few of the different types of U. S. Reels and Cradles for handling material in coils.

AMPERE (East Orange), N. J.

BUILDERS OF U. S. AUTOMATIC PRESS ROOM EQUIPMENT, U. S. MULTI MILLERS, U. S. MULTI SLIDES, U. S. DIE SETS AND ACCESSORIES.



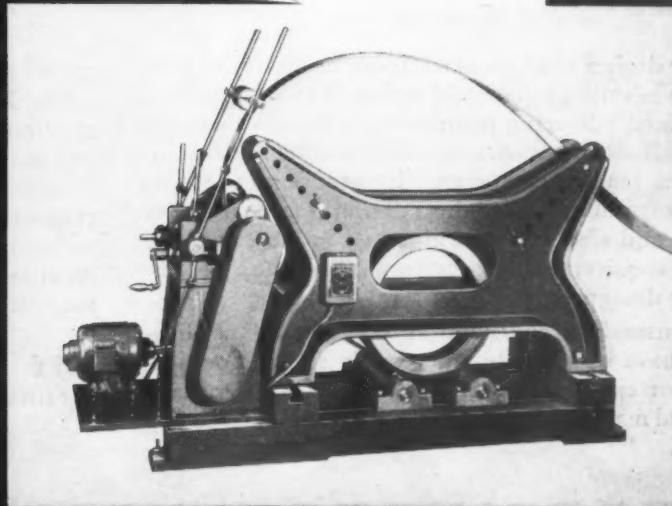
4 (Above) No. ACR-2

U. S. Automatic Centralizing Stock Reel
(Vertical Type).



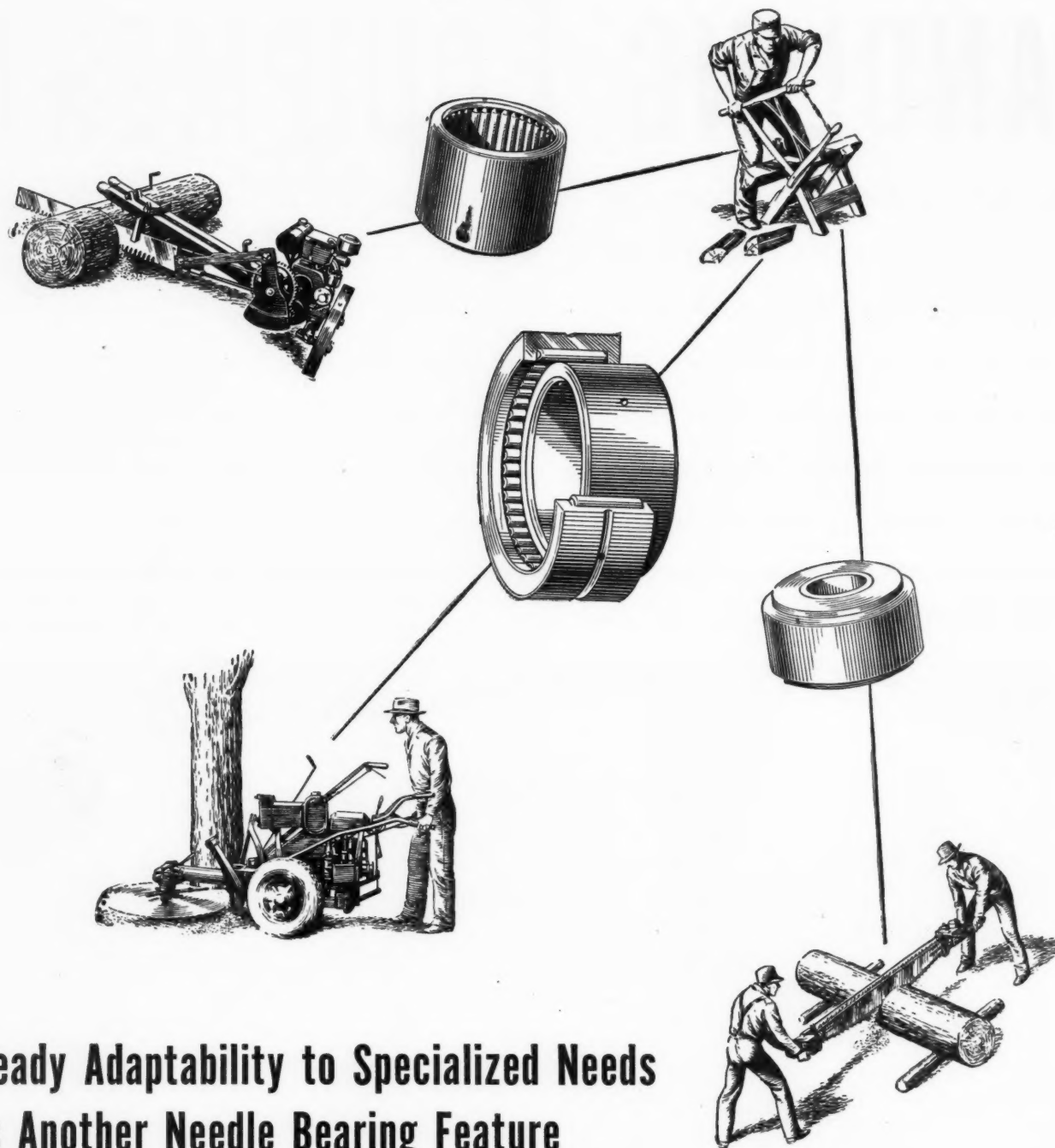
5 (Above Right) No. AR-10 SPECIAL

U. S. Automatic Stock Reel (Horizontal Type).



6 (Right) No. CC-2-12

U. S. Automatic Coil Cradle.



Ready Adaptability to Specialized Needs is Another Needle Bearing Feature

Major design changes are seldom necessary to gain all the advantages of anti-friction Needle Bearings. The Needle Bearing principle of a full-complement of small diameter needle rollers which gives increased load capacity and longer service life is widely applicable. And the Torrington line includes a type and size that is engineered to meet virtually every requirement of modern space-plus-weight-saving designs.

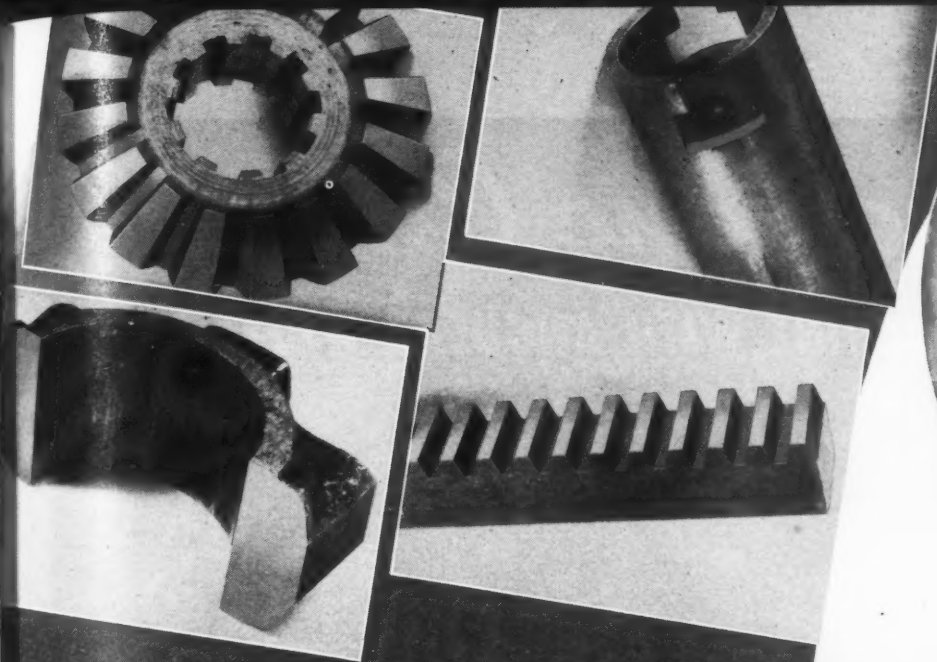
Thousands of outstandingly successful applications have been made where only slight modifications of existing designs and shop practice have enabled manufacturers to improve product efficiency

—and often with resulting cost savings.

Let us give you more details on some of these applications in your own field. Full technical data and many applications are given in the Torrington Needle Bearing Catalog No. 32, available upon request. And our engineering staff will be glad to give every assistance in the layout of specific Needle Bearing applications designed to meet *your* requirements.

THE TORRINGTON COMPANY
TORRINGTON, CONN. SOUTH BEND 21, IND.
Offices in All Principal Cities

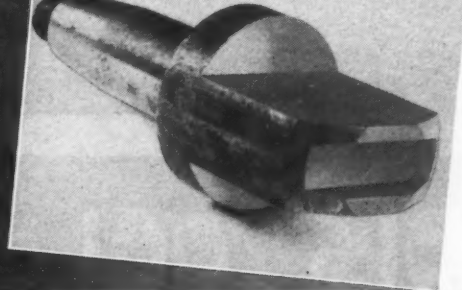
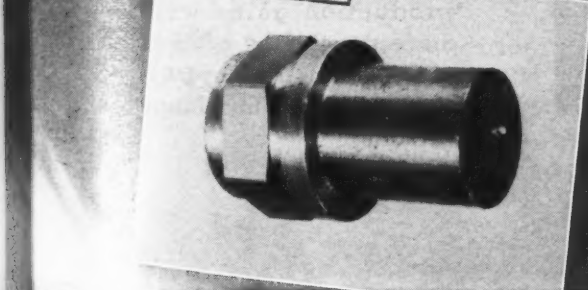
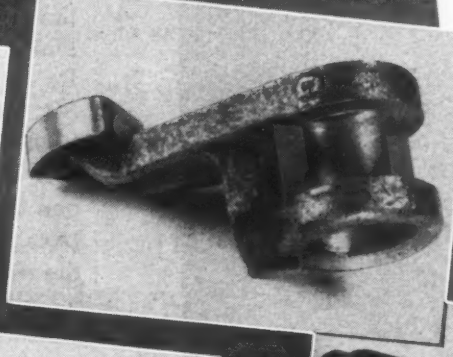
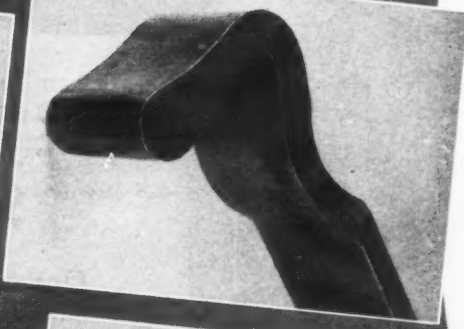
TORRINGTON NEEDLE BEARINGS



Surface Broaching

for MACHINING IRREGULAR FORMS

IRREGULARLY shaped parts having curved, slotted beveled or serrated surfaces may be broached on Footburt machines at high production rates. Surface broaching is now being used in many plants to produce work similar to these illustrations, with higher production per machine and lower tool maintenance cost than was possible with former machining methods. We will be glad to work with you on the possibility of applying surface broaching to your work. Just send blueprints of your parts with information on number of pieces per hour required.



**THE FOOTE-BURT
COMPANY**

Cleveland 8, Ohio

Detroit Office:
General Motors Building

Footburt Patented Tooth Form

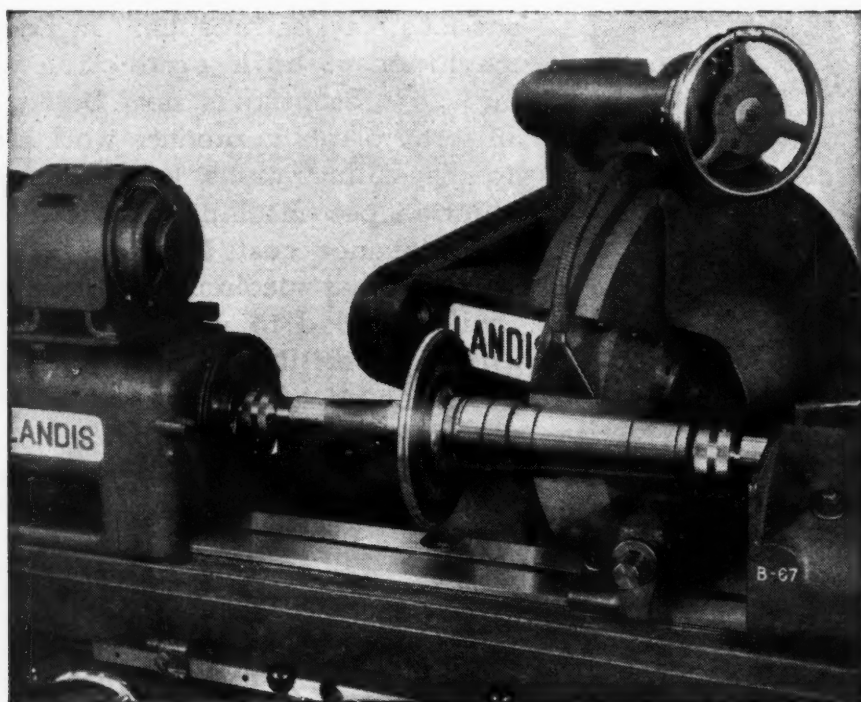
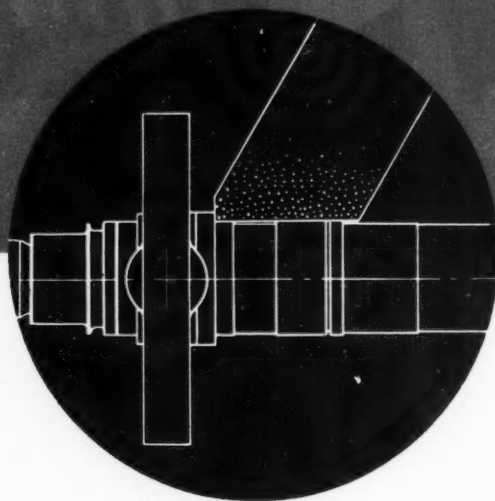
FOOTBURT *Surface Broaching*

Grinding Time Cut 50%

ON STANDARD MACHINE WITH ANGULAR WHEEL BASE

The Problem

To reduce grinding time of shoulder, fillet and adjacent diameter on airplane propeller shaft. Conventional method of grinding diameter and then traversing wheel by hand to grind shoulder not fast enough for high production.



THE LANDIS TOOL SOLUTION

Our engineers started with a standard machine, the 14" x 36" Type CH Plain Hydraulic Grinder. By setting the wheel at a 30° angle, the shoulder, fillet and adjacent diameter could be ground at one time. Since the wheel base would interfere with the work, the wheel was mounted on the right side instead of the left. Further production gains were made possible by addition of the Landis Tool hydraulic rapid infeed for plunge grinding.

LANDIS TOOL

Precision Grinders

LANDIS TOOL COMPANY





14" x 36" CH PLAIN GRINDER with 30° angle wheel base, right hand wheel mounting. Plus hydraulic rapid infeed, table type diamond holder for face dressing, table type side truing bar, ball bearing live work centers.

*Another Example of LANDIS TOOL
Engineered Grinding Service*

● Here is another production grinding problem where Landis Tool engineers combined two grinding operations by modifying a standard machine. As a result, grinding time was cut more than 50% and airplane propeller shaft production was increased. The solution to this kind of problem is typical of the help that you can get from Landis Tool to solve your grinding problems. Each problem is analyzed by engineers experienced in grinding production.

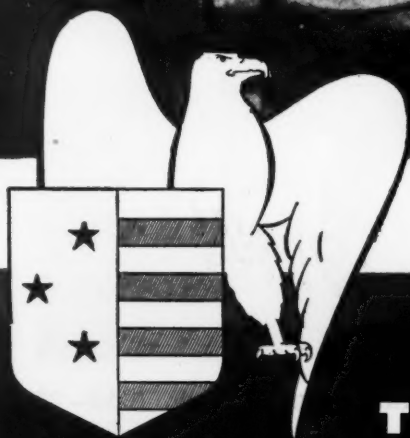
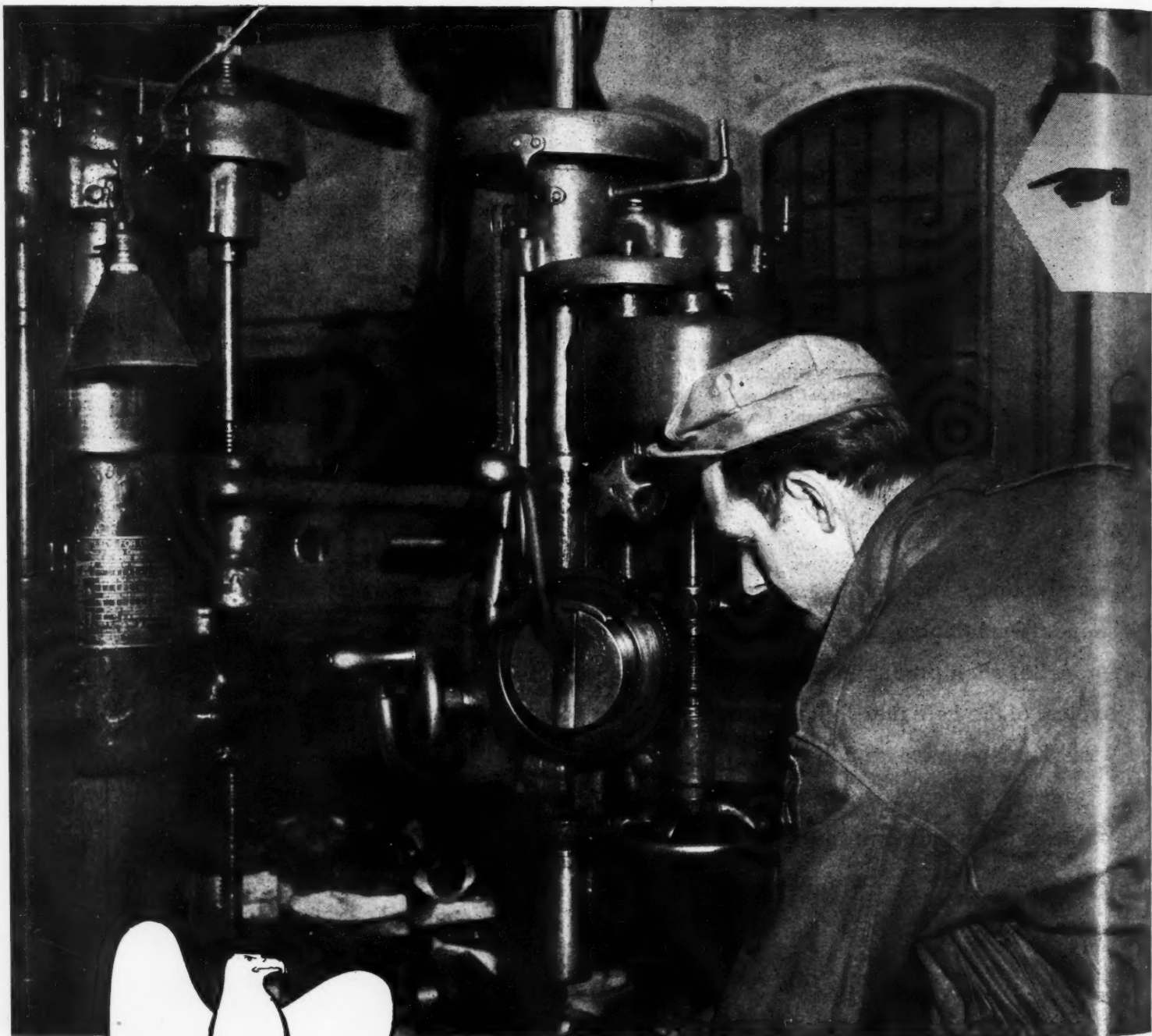
Our recommendation for your problem may involve modifying a standard machine or the building of special fixtures to get your production or tolerances. Call on us for Landis Tool engineered grinding service.

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WAYNESBORO, PENNA.

LANDIS TOOL
Company

"AS OLD AS



THE AMERICAN TOOL WORKS CO.

METHUSELAH"

BUT STILL ON THE JOB...



This War Department Photograph shows this 30-year-old "American" Radial still on active duty.

Doubtless it is expedient, during an emergency, to press usable machines into service in spite of their age, but such practice should be abandoned the instant that the emergency has passed. It is just too costly a practice for peacetime economy.

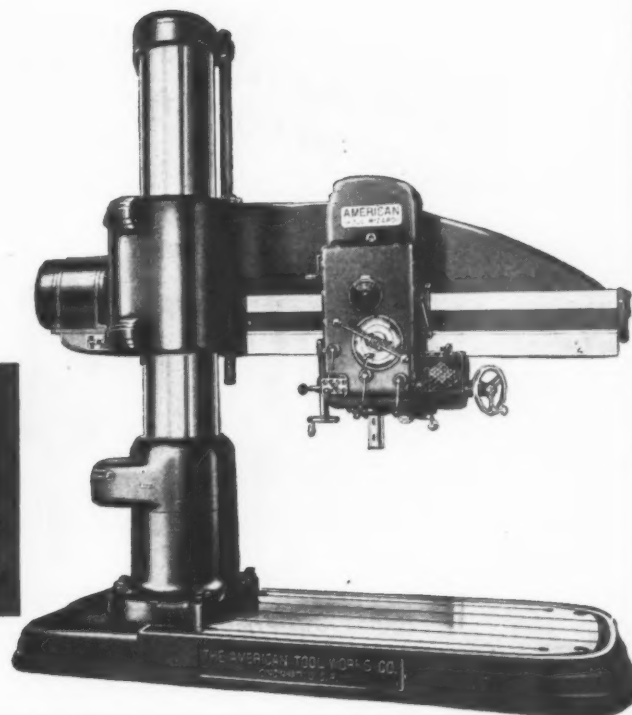
Unfortunately there are entirely too many machines of this vintage still in operation in metal working plants right here in our own country. They will have to be replaced with modern equipment just as quickly as possible if the low cost demands of the future are to be met.

Now compare the new 1945 model with its 30-year-old prototype and you will immediately see why these older models cannot be profitably used today.

	No. of Spindle Speeds	Top Spindle Speed	No. of Feeds	H. P. Motor Used for Driving	Weight
1945 Model . .	32	2000 r.p.m.	16	15	13,000 lbs.
1914 Model . .	12	500 r.p.m.	4	5	7,000 lbs.

Modernize with "American"—the "newest new radial".

"American" Radials are low cost producers. They are modern; they are powerful; they have the stamina to insure unfaltering operation.

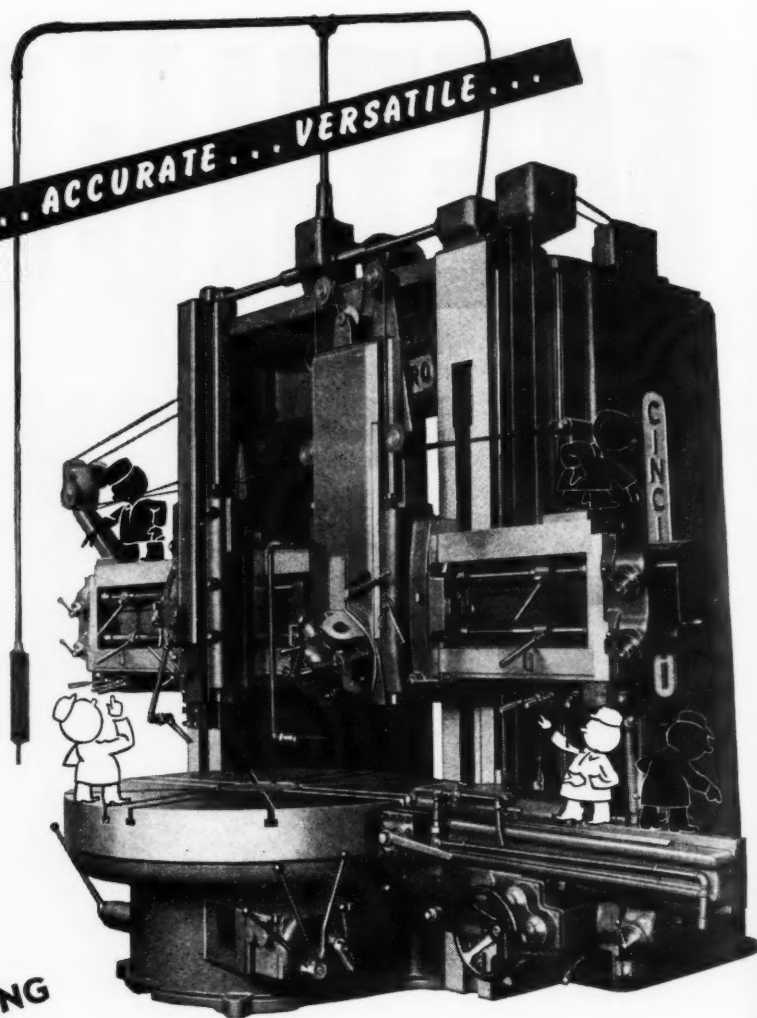


Send for descriptive literature

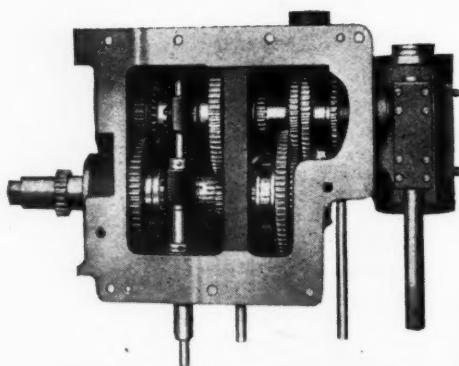
Lathes and Radial Drills Cincinnati, Ohio U.S.A.

IT'S FAST... ACCURATE... VERSATILE...

The NEW and
IMPROVED
CINCINNATI
HYPRO
Boring Mill



FEATURING INDEPENDENT FEED,
RAPID TRAVERSE AND REVERSING
MECHANISM FOR EACH HEAD



*Hypro Anti-Friction Power Feed
and Traverse Box*



An individual unit is provided for each Head and contains the complete power feed, rapid traverse, reversing mechanism and safety clutches.



All levers for feed, traverse and reverse are placed in front of the machine convenient to operator's working position.



Each box contains hardened alloy steel gearing mounted on multiple splined shafts and anti-friction bearings. Complete unit is enclosed and runs in a bath of oil supplied by a pump incorporated in the box.

THE CINCINNATI HYPRO PLANER COMPANY
PLANERS - BORING MILLS - PLANER TYPE MILLERS
CINCINNATI, OHIO



Actual photo of Gear Department Foreman (left) consulting with a Gulf Service Engineer on results with Gulf Lasupar Cutting Oil in hobbing gears.

"With **Gulf Lasupar Cutting Oil**
we increased production over 40%
and get an extremely smooth finish"

SAYS THIS FOREMAN

"GULF LASUPAR CUTTING OIL has proved superior to all other cutting oils we tested for hobbing gears," says this Foreman. "With this fine cutting oil, we increased production 40 per cent, and get an extremely smooth finish."

Here's a cutting oil that offers important help to you in the coming "battle of costs"! Gulf Lasupar Cutting Oil has the combination of characteristics needed to handle the modern steels. It works well at speeds once thought impossibly high. It cuts machin-

ing costs—often improves production as much as 50 per cent, and meets requirements for an exceptionally fine finish on the work.

Call in a Gulf Service Engineer today and let him demonstrate how this cutting oil can help you improve your machining practice. Gulf Lasupar Cutting Oil—and the other quality cutting oils in Gulf's complete line—are available to you through 1200 warehouses in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office.



GULF QUALITY CUTTING OILS

Gulf Lasupar Cutting Oils A, B, and C
Gulf Electro Cutting Oils A, B, and C
Gulf M-L Cutting Oils A, B, and C
Gulf Cut-Aid : Gulf Cutx B : Gulf L. S. Cutting Base A and B

Gulf Oil Corporation • Gulf Refining Company
Gulf Building, Pittsburgh 30, Pa.

Gulf Oil Corporation • Gulf Refining Company
3900 Gulf Building, Pittsburgh 30, Pa.

M

Please send me, without obligation, a copy of the booklet, "Gulf Cutting Oils," which includes a helpful Machining Guide.

Name.....

Company.....

Title.....

Address.....

MACHINERY, March, 1946—29

HIGH PRODUCTION BY A WARNER & SWASEY

● At Marvin Machine Products Company, Milwaukee, production was already high on the job. Using a Warner & Swasey No. 5 Universal Turret Lathe, the Marvin Company turned out 678 bushings per 50-hour week from 2½" hot rolled bar stock. Each piece called for five operations—drilling, rough boring, finish boring, turning and cutting off.

Yet when a Warner & Swasey Collet Chuck Booster was installed, production jumped from 678 to 873 pieces per week—an increase of 28½%! By taking the hard work out of tightening the collet chuck, the Warner & Swasey

Electric Booster permits the operator to conserve all her strength and attention for the machining job.

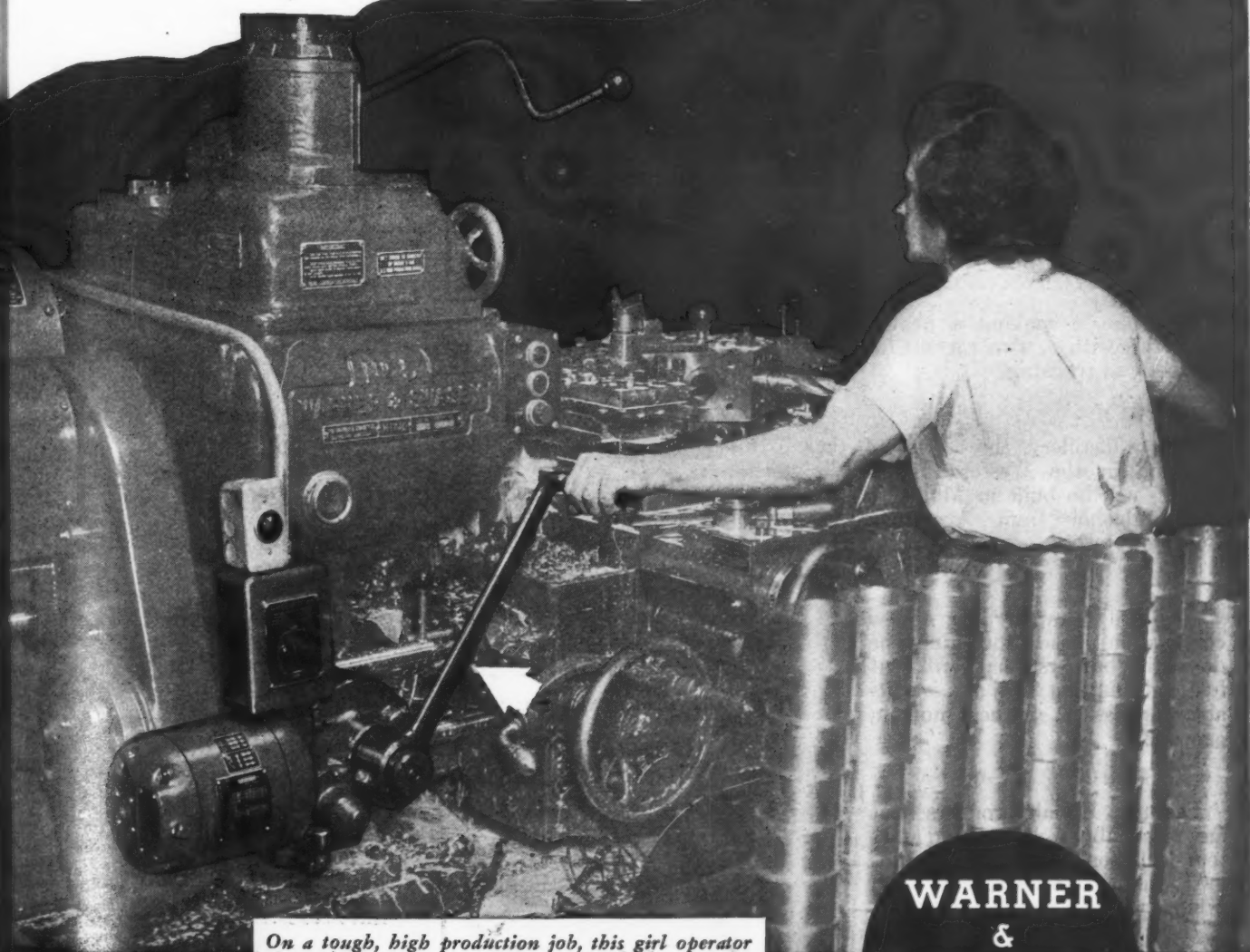
Today, a girl operator weighing 118 pounds is setting new production records, with far less scrap loss and without chucking trouble or evident fatigue.

If you have or expect a job calling for frequent collet chuckings, ask a Warner & Swasey Field Engineer to give you an idea of how much a Warner & Swasey Collet Chuck Booster will up production! Or write Warner & Swasey, Cleveland.

**TURRET LATHES, SADDLE AND RAM TYPES... MULTIPLE SPINDLE AUTOMATICS
CHUCKING AND BAR TOOLS... PRECISION TAPPING AND THREADING MACHINES**

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS.

UPPED $28\frac{1}{2}\%$ COLLET CHUCK BOOSTER



On a tough, high production job, this girl operator now produces $28\frac{1}{2}\%$ more using a Warner & Swasey Collet Chuck Booster.

ESS. WITH A WARNER & SWASEY

**WARNER
&
SWASEY**
Machine Tools
Cleveland

The CONE AUTOMATIC MACHINE COMPANY



sees many

GOOD THINGS AHEAD

It is reported that

The National Advisory Committee for Aeronautics proposes to release to schools, libraries and industries over 300 technical reports hitherto secret.

get ready with CONE for tomorrow

Lycoming is experimenting with two new aircraft engines: a 36-cylinder, 5,500 lb. radial developing 5,000 h.p., and a 12-cylinder, 2,100 h.p., weighing only 1,445 lbs.

get ready with CONE for tomorrow

Monsanto Chemical Co. has a plastic armor plate that has shattered machine gun bullets in tests.

get ready with CONE for tomorrow

Curtiss-Wright is working on an "uninhabited" airplane capable of 1,400 miles per hour.

get ready with CONE for tomorrow

Firestone is making a heavy-duty tire with a wire carcass for off-the-road trucking.

get ready with CONE for tomorrow

A new distillery, the largest of its kind in the Western Hemisphere, will be built in Maine to make alcohol from Aroostook County potatoes.

get ready with CONE for tomorrow

Shell Oil Company has a new combustion head for gun-type domestic burners that will cut fuel consumption 20% and is suitable for use on burners now in operation.

get ready with CONE for tomorrow

Eastman Kodak promises that any reasonably well equipped amateur will soon be able to make his own color transparencies and prints.

get ready with CONE for tomorrow

Jack and Heintz will manufacture the Skinner gasoline engine. This is a double-opposed "pancake" type, made largely of aluminum with a compression ratio of 8 to 1 and a weight of less than 2 lbs. per h.p.

Mellon Institute has found, after thorough testing, that solid magnesium alloys do not burn.

get ready with CONE for tomorrow

The Weather Bureau has begun a survey of the country's wind resources in anticipation of the use of wind power for generating electricity.

get ready with CONE for tomorrow

A new kind of glass made by American Optical Company transmits 90% of visible light rays, but only 10% of heat rays.

get ready with CONE for tomorrow

Fifteen years of research have led to a form of porcelain enamel, made by C. Hommel Co. of Pittsburgh, that is so thin as to be practically chipless.

National Carbon Company has a new oil made with a secret non-petroleum base, called "Prestone Motor Oil" that shows very little change in viscosity from 30° below zero to operating temperature.

get ready with CONE for tomorrow

Illinois Central and Edison General Appliance Co. have collaborated on the first all-electric dining car, scheduled to go into service early in 1946. The car has its own diesel generating plant which supplies all facilities for cooking, freezing, dish washing, garbage disposal and air conditioning.

get ready with CONE for tomorrow

The Celotex Corporation has patented a process for making building planks out of excelsior and Portland cement.

get ready with CONE for tomorrow

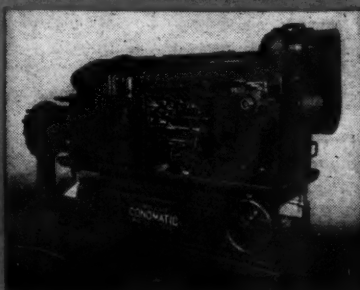
Another substitute for natural paint brush bristle is made of casein and was developed by the Eastern Regional Laboratory of the U. S. Department of Agriculture.

3 of these diameters are eccentric



This washing machine part, made of P-1112, is machined from round stock on a 1½" 8-Spindle Conomatic in 10 seconds. Three of its five diameters are eccentric to .018".

Write to Cone for particulars.



Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

25

Two services that help you to lower lubrication and maintenance costs

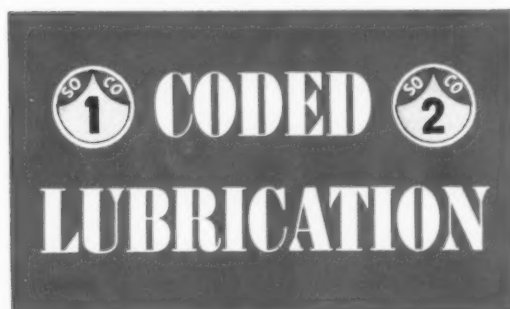
TWO HELPFUL services described at the right are offered by Standard Oil to manufacturers in the Middle West. They are designed to take guess work out of plant lubrication. First, by providing experienced Lubrication Engineers to help you choose the right lubricant for every application. Second, by insuring that the *right* lubricant is applied in the *right* places by means of a coded lubrication system. You can get both of these services by writing Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois, and asking for the Lubrication Engineer nearest you.



Lubrication Engineering Service

Standard Oil has experienced Lubrication Engineers located in principal cities throughout the midwestern states shown on the map.

These Engineers have two advantages when analyzing your lubrication needs. They are familiar with the operation of all types of plant equipment—as are your plant personnel—and they have a complete knowledge of the lubricants available to meet your requirements. Thus Standard Oil Lubrication Engineers can help you *get the right lubricant.*



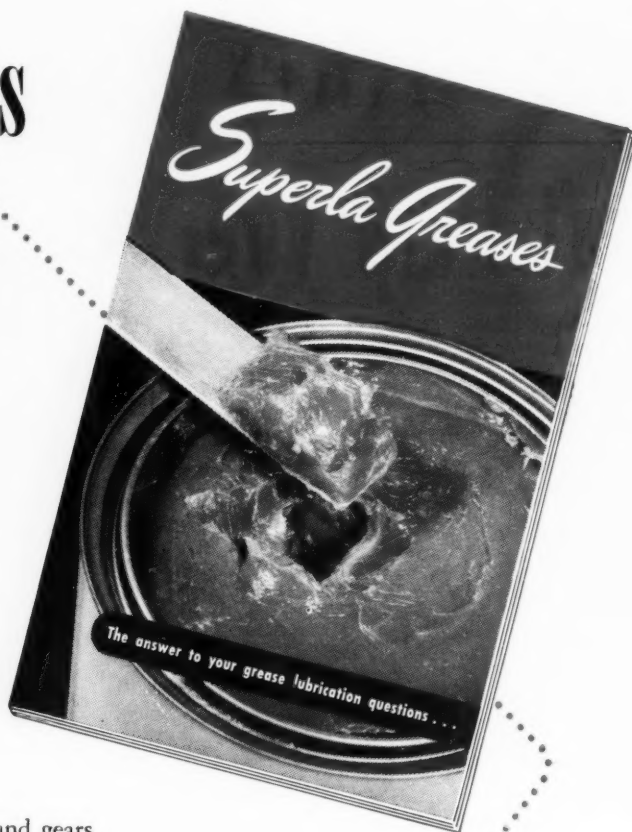
In addition, these Engineers can supply you with a simple Coded System for applying lubricants. Briefly, the system provides for numbering all lubricants used in your plant. Every drum, oil can, or grease gun used for dispensing lubricants is identified by a number to indicate the lubricant it contains. Each spot to be lubricated is also marked by a number to indicate the lubricants required.

Your oilers follow the code numbers. The *right* lubricant is applied to the *right* places every time.

STANDARD OIL COMPANY (INDIANA)

**STANDARD
SERVICE**

What qualities to look for in cost-saving greases



QUALITIES that reduce wear on bearings and gears ... that stop excessive consumption ... that cut oiler time for servicing equipment ... these are the qualities you want in a grease. What they are and how you can get them is described in a booklet illustrated at right.

Many of the advantages, which you would expect to find only in special purpose, premium priced greases, are available in a line of 11 grades—including high-temperature greases—called

**SUPERLA
GREASES**

Send for this Booklet

It tells how the most desirable qualities have been incorporated in a complete line of grease to reduce costs on a wide range of Industrial application.

It also has hints on hand packing anti-friction bearings and avoiding over-lubrication.

You can get a copy from the Standard Oil Industrial Service Representative who calls on you or by writing Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

**STANDARD
SERVICE**



APOSTLE OF PRODUCTION

Steel has been made for many centuries prior to Henry Bessemer's work, but processes were painfully slow and prices prohibitively high. As a result, the steel industry was small and employed but few people.

When the Bessemer Converter reduced steel making time from six weeks to less than one hour, steel became available for the most commonplace use. Thus production's fundamental law was demonstrated . . . that speed in manufacture gives lower cost and therefore greater product use.

This law is still fundamentally sound and Clearing Presses provide another good demonstration. In hundreds of plants today, Clearing Presses are helping to provide finished products faster with greater accuracy and at lower cost. You are invited to consult with Clearing engineers at any time, whether your problem be faster production to decrease unit cost or new methods to improve quality or appearance.

Clearing presses are good examples of modern machines that help to produce more and better metal parts at lower cost than ever before.

CLEARING MACHINE CORPORATION
6499 West 65th Street, Chicago 38, Illinois



700-Ton Clearing Hydraulic

This 700-ton capacity Clearing Hydraulic Press will soon be on a production line helping to fill America's need for peacetime products. Typical of Clearing's service, the design of this press began with a complete analysis of the user's production requirements in terms of parts to be made and volume desired. This Press has a maximum stroke of 48", shut height of 76", bed area 60" x 144", and capacity of 700 tons. Write for Clearing Press information and recommendations based on your production needs.

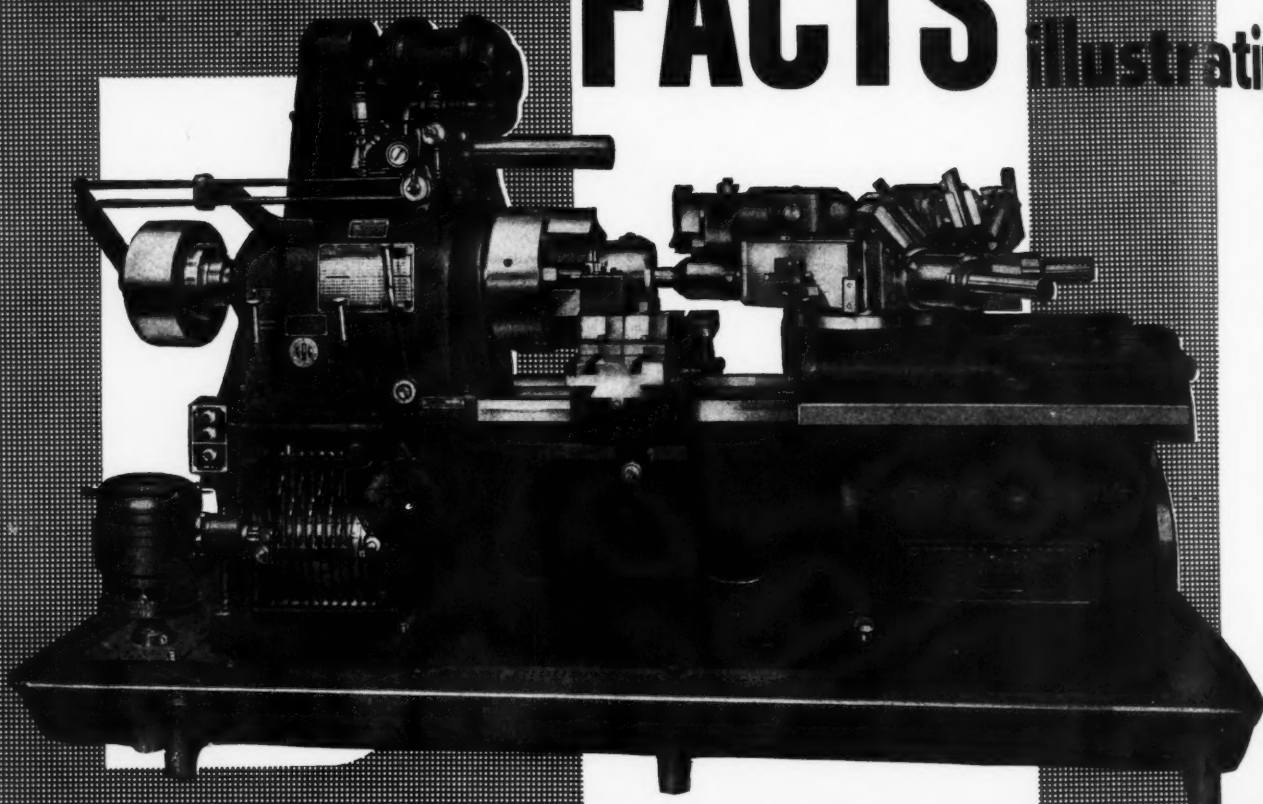
CLEARING MECHANICAL AND HYDRAULIC PRESSES

FOR DRAWING • BLANKING • FORMING • FORGING



FACTS

illustrating the



SPECIFICATIONS

Swing over Bed	25"
Swing over Cross Slide	12"
Travel over Cross Slide	5" ea. way
No. of Turret Faces	5 Std., 4 and 6 Spec.
Total Turret Slide Travel	13"
Turret Feed	8"
Turret Slide Adjustment	8-5/8"
Cross Slide Adjustment	11-7/8"
Dia. Hole through Spindle	2-5/8"
HP to Drive	10 to 15
Net Weight	12,500 lbs.
Dimensions for Shipment - 10' 3" x 5' 6" x 6'	



POTTER & JOHNSTON

the high productive capacity of the 5-D POWERFLEX

The P&J POWERFLEX Automatic Chucking and Turning Machine is most profitably applied to the production of work requiring flexibility and a high output. In fact, it can be demonstrated (for work within its range) that its output per spindle greatly exceeds the output by the best previous practice, and that labor costs can be greatly reduced. To accomplish this, the 5-D POWERFLEX provides Ample Power • Great Rigidity • Automatic Changes of Spindle Speeds, While Under Cut, in a Range of 20 Speeds Between 16 and 304 rpm • 3 Selective Automatic Changes of Feed • Automatic Binding of Turret Following Index • Powerful and Direct Cross Slide Action • Constant High Speed Motion to the Cross Slide and Turret Slide •

Cross Slide Longitudinal Adjustment for Maintaining Slide in Correct Relation to the Work and for Maintaining Cutting Pressure on Tools Within the Ways of the Slide • Automatic Spindle Stop Returns Cutting Tools to Neutral Without Scoring Work.

These are but a few of the FACTS of interest to production engineers. Additional FACTS are listed under "Features" and "Specifications". The entire story of the phenomenal success of the 5-D POWERFLEX may be obtained by writing for Bulletin 122 (containing illustrations and all specifications in precise detail), and by submitting your prints for P&J Tooling recommendations and comparative "case histories".

Features

HEADSTOCK

Spindle of high carbon steel forging mounted on oversize Timken Tapered Roller Bearings. Gearing of chrome nickel steel, heat treated, running in bath of oil. Shafts of alloy steel, heat treated, mounted on Timken Tapered Roller Bearings. Any group of 4 automatic speed changes.

SPEEDS AND FEEDS

Power operated automatic clutches under dog or hand control. All changes of speed and feed easily obtained while Machine is under cutting load.

CROSS SLIDE

New design. Cam drum-located under cross slide; all bearing cam roll studs mounted in cross slide for direct connection. Drive to cam drum through worm gearing.

FEED BOX

Twenty-four feed changes in geometric progression from .007" to .165" per rev., or .007" to .083" per rev. Three selective automatic feed changes. Fast motion is constant, drive directly from driving pulley.

TURRET SLIDE

Extremely rigid. Hardened and ground steel inserts form bearing on base ways. Liberal dimensions. All parts of Geneva unit subject to strain are of heat treated alloy steel.

BASE UNIT

Hardened and ground steel ways with liberal dimensions. Entire unit is designed to assure permanency of alignment, freedom from scoring, maximum operator convenience under heavy production requirements.

BULLETIN 122



Although workable data on the P&J 5-D POWERFLEX is listed on these pages, the Production Engineer will want these FACTS, plus additional illustrations and details, for his files. We suggest you write for this complete Bulletin 122.

MACHINE COMPANY • PAWTUCKET • RHODE ISLAND

ni *Announces*

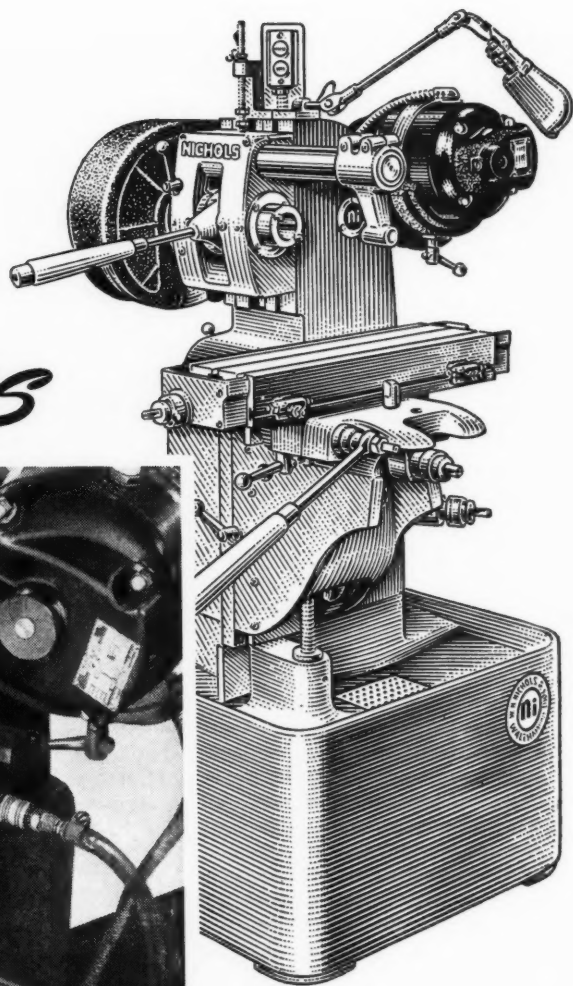
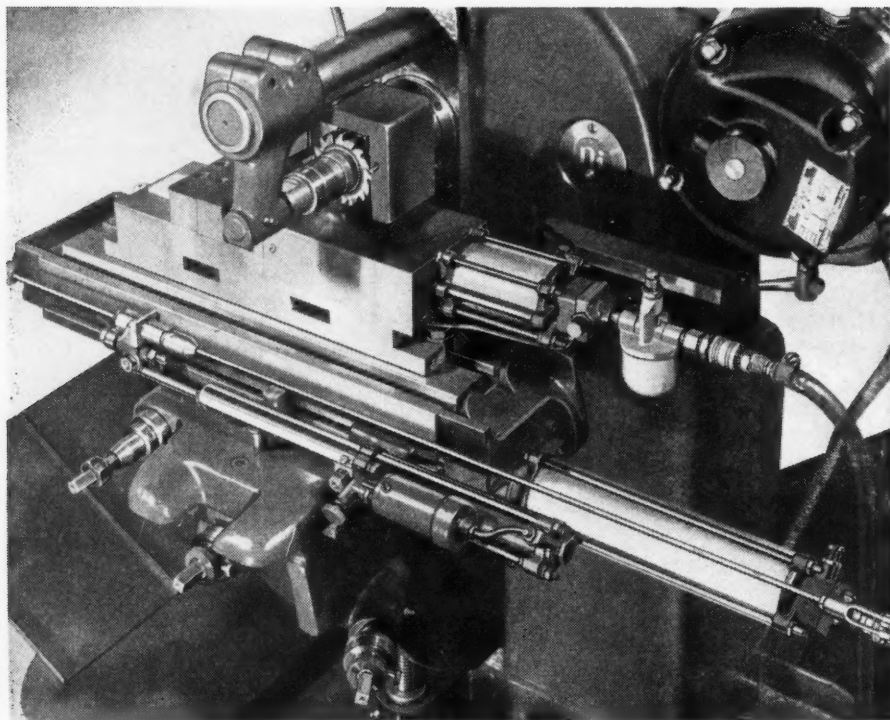


Photo shows Nichols power feed attachment installed. In this case, work is held in an air-operated vise

a *Power* feed attachment for any *Nichols* Miller

Here is a tested and proved power feed attachment that is an added production asset for any Nichols Miller. It is designed to reduce the time of the operating cycle and reduce the operator's duties so that often one operator can run two or more machines.

This power feed attachment is designed for fast table advance — maximum proper cutting feed — fast table reverse—automatic shut-off. It is completely automatic except for loading and unloading the work. Rapid traverse and work speeds are easily and quickly changed to suit

all classes of jobs within the capacity of the machine.

Basically this attachment is a Bellows air feed unit used in conjunction with a Hydro-Check. Thus a positive, infinitely variable feed is obtained throughout the 9" maximum cutting stroke by using regular shop air lines with 75. to 175 lbs. pressure.

The Nichols power feed attachment can be installed either before or after shipment of the Nichols Miller. It can be installed quickly on any Nichols Miller ever built. Write for details.

T H E *Nichols* **M I L L E R**

MANUFACTURED BY W. H. NICHOLS & SONS, WALTHAM, MASSACHUSETTS
NATIONAL DISTRIBUTORS: NICHOLS-MORRIS CORP., 42 CHURCH ST., NEW YORK 7, N. Y.

38—MACHINERY, March, 1946

Send for free Nichols Miller Catalog



Perfected for Production ...by **UNION**

We had your production in mind
when we perfected Union Tools.
Your requirements — and
your practical shop experiences
have helped us
design tools which will
give you better results...
consistent
high accuracy,
consistent low costs.
Keep your production
curve rising! Union —
The Tools You Buy Again —
will help you do it.

**UNION TWIST DRILL CO.
ATHOL MASS.**

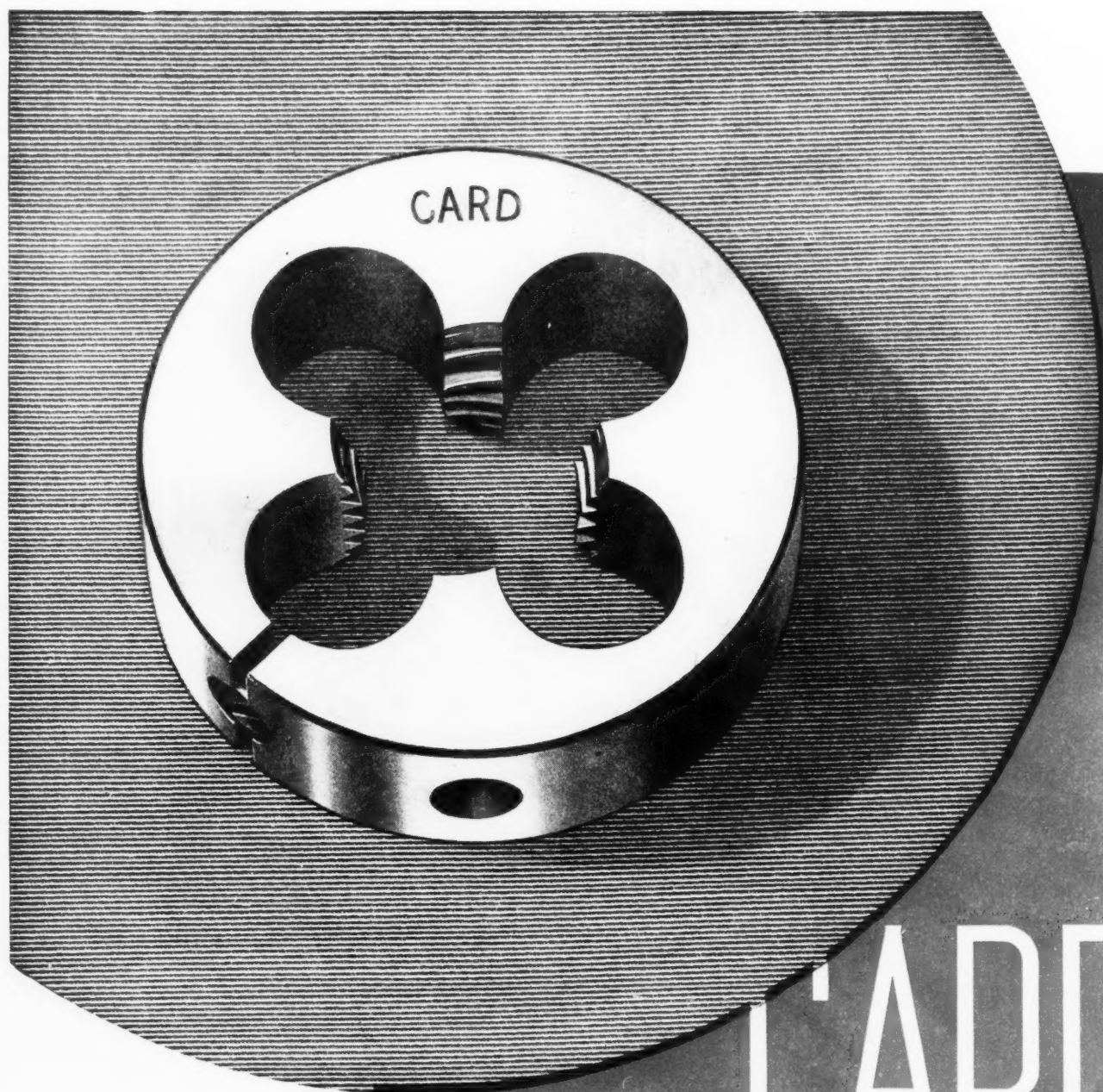
S. W. Card Mfg. Co. Div.,—Mansfield, Mass.
Butterfield Div., Derby Line, Vt.
Butterfield D.V., Rock Island, Quebec

UNION ★ BUTTERFIELD ★ CARD Divisions of the Union Twist Drill Co.

New York: 61 Beade St.
Chicago: 11 So. Clinton St.
Detroit: 1533 Woodward Ave.

STORES:

San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 555 First Ave. South



CARD

Round DIES

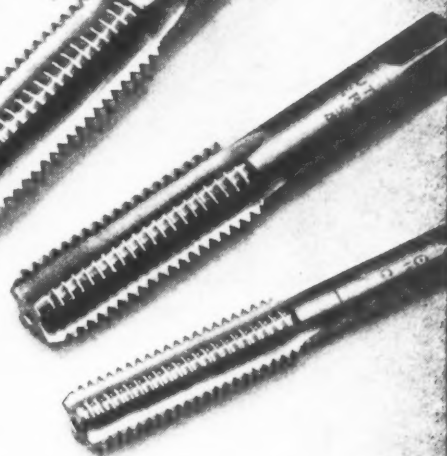
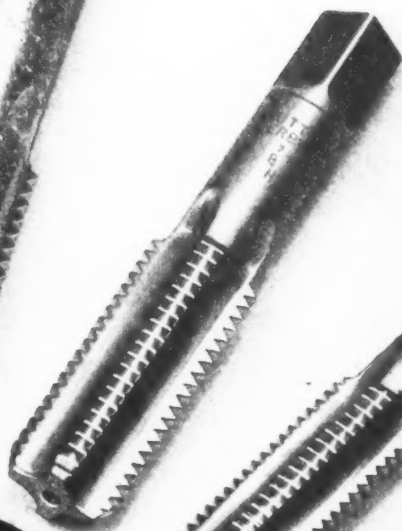
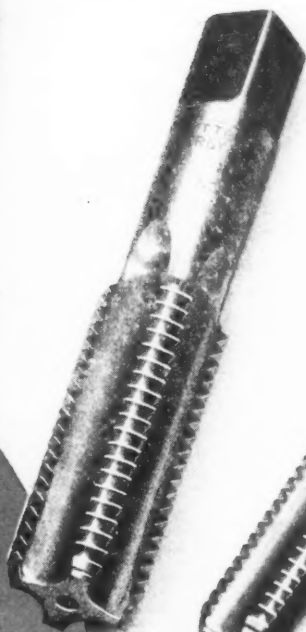
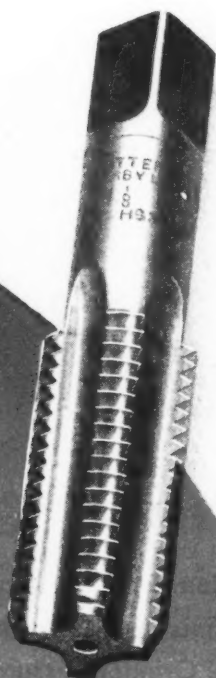
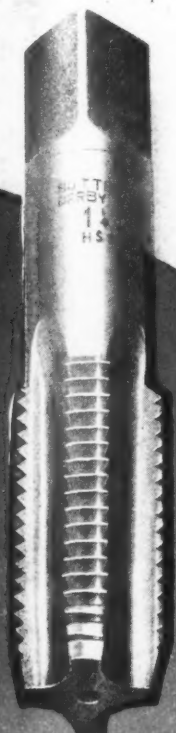
S. W. CARD MFG. CO.
MANSFIELD, MASS.

STORES

New York: 61 Reade St.
Chicago: 11 So. Clinton St.
Detroit: 5527 Woodward Ave.
San Francisco: 121 Second St.
Los Angeles: 524 E. Fourth St.
Seattle: 568 First Ave., South

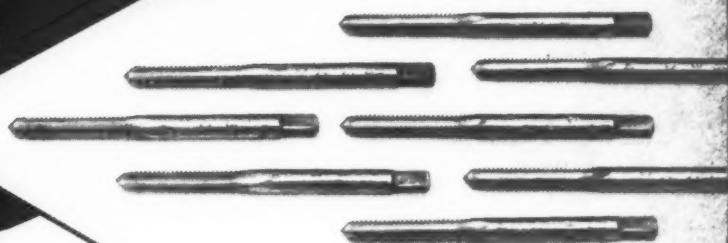
Card Adjustable Round Split Dies are carefully produced of hardened tool steel, adjustable by the simple use of a taper screw . . . can be removed from holder without losing size. Available in all standard sizes and thread forms.

UNION ★ BUTTERFIELD ★ CARD



In wartime as well as peacetime production, tool economy is a desirable asset. Butterfield Taps—in all sizes, types and thread forms—feature tool-saving and time-saving qualities to assure long, accurate and economical service. You get Quality when you order

Butterfield TAPS



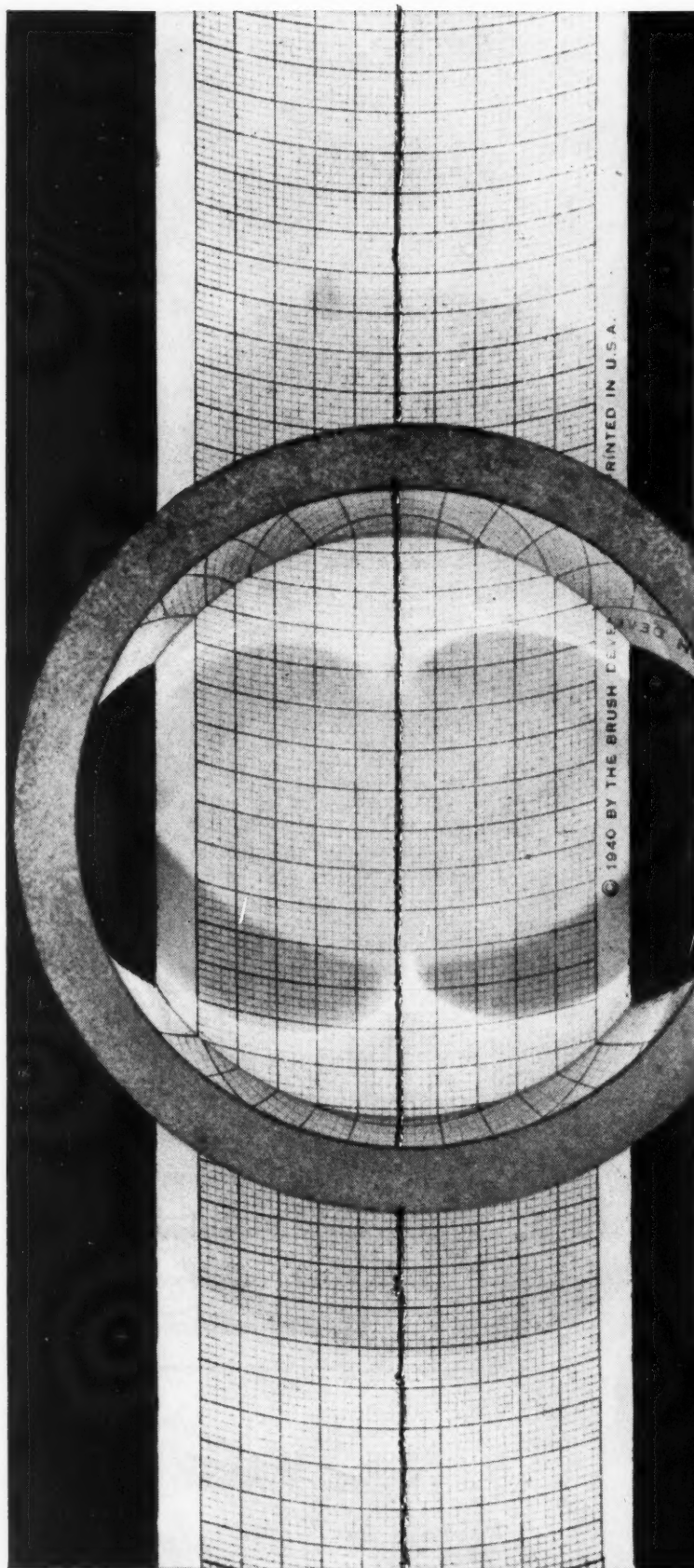
BUTTERFIELD DIVISION

DERBY LINE, VT. ROCK ISLAND, QUE.

STORES: New York, 61 Reade St.—Chicago, 11 So. Clinton St.—Cleveland 15, Hal. W. Reynolds Co., 2902 Euclid Ave.—Detroit 5527 Woodward Ave.—Los Angeles, 524 E. Fourth St.—Toronto, 137 Wellington St. West—Montreal, 111 St. Paul St. West—Winnipeg, 466 Travellers Bldg.—Vancouver, 327 Shelby Bldg. Agents for Great Britain: Charles Churchill & Co., Ltd., 27-34 Walnut Tree Walk, Kennington, London, S.E. 11, England. Branches at Birmingham, Manchester, Glasgow, Newcastle-on-Tyne and Bristol.



Divisions of the Union Twist Drill Company



A REFLECTION OF

Character

in millionths of an inch

The reflection in the bushing, at left, shows a surface finish which assures long bearing life. Bryant Grinders assure fine work finish *and something more*—work ground internally on Bryant Grinders is also straight and round. It is the combination of these three prime essentials that gives character to Bryant-ground parts—in millionths of an inch, if desired. These essentials give character and long life to the assemblies and products which you manufacture.

We know your problem is different

... practically every internal grinding problem is different, but when you require extreme accuracy or high production, or *both*, your first step should be to study your problem with a man who makes it his business to solve them. Your first step should be to—

Send for the Man from Bryant!

This bushing, with hole ground in a Bryant Grinder, was checked for surface accuracy. The chart line shows deviation. Distance between vertical lines represents one-millionth of an inch.

BRYANT



BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

THE FIRST STEP *in Buying* SMALL GEARS



Discuss with a G. S. engineer *the precise job you want the gear to do*. If possible do this even before blueprints or detailed specifications have been completed. That is the first step, the most efficient and successful way to buy small gears. G. S. will bring to your gear problem a wealth of knowledge and experience gained in a quarter century of specialization. Our seasoned counsel frequently avoids costly mistakes. It shows the way to real economies made possible by methods and machinery specially designed for the uniform, quantity production of *better* Fractional Horsepower Gears. Ask us, now, how we can best serve you.

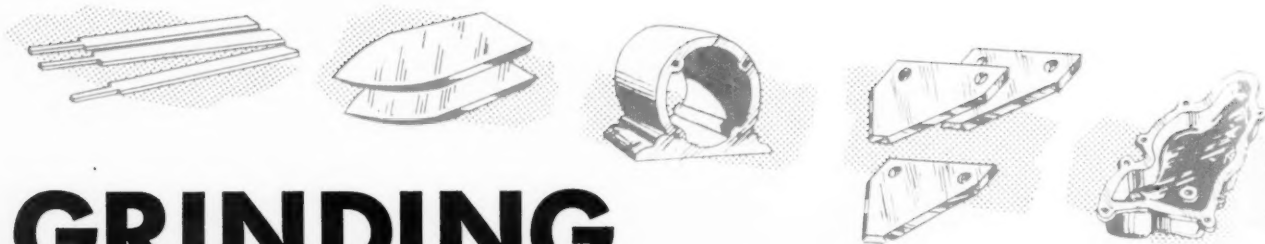
GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding
2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS



COLOSSUS of



GRINDING

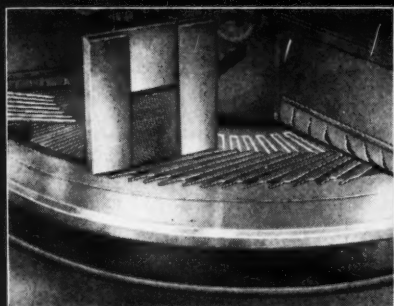
**ROUGH . . SEMI-FINISH . . FINISH
IN ONE PASS THROUGH A 72!**

The three-step grinding cycle of the Hanchett 72 will carry your work through from the first rough cut to the final micro finish—at production rates that equal the output of three single purpose surface grinders!

Fixtures can usually be designed to enable one operator to do the work of loading and unloading. (See examples below.) Work sizers mounted after each wheel can regulate the feed

within .0002" if desired. All controls are mounted in a centralized push-button panel simplifying operation. Ammeters for each wheel enable operator to check constantly on grinding efficiency. A red light flashes when wheels have been worn to their useful limit. The chance of human error is practically eliminated, when you turn over Production Surface Grinding to a Hanchett 72! For complete data and specifications, write for your copy of Bulletin 141-3MC today.

ON LARGE AND SMALL PARTS—MORE PRODUCTION



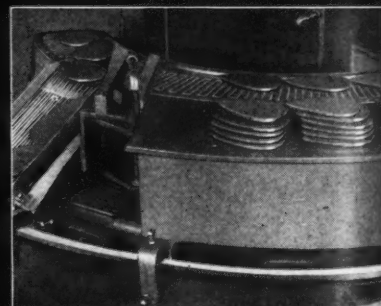
900 FILES

Grinding 8" file blanks from the rough, 900 and more per hour. Loaded and unloaded automatically, sectional magnetic chuck used.



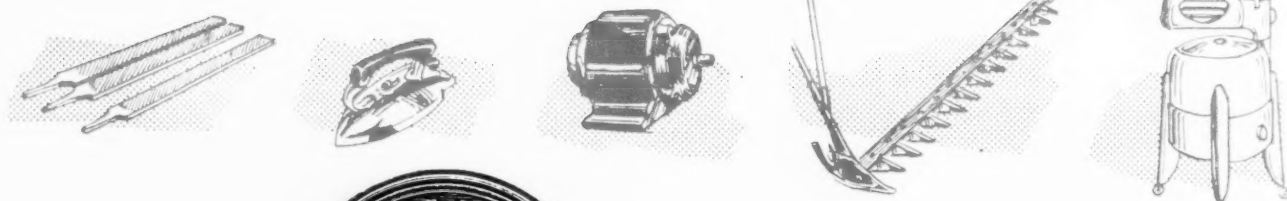
900 CONNECTING RODS

Finished parallel within .00075". Stock removal .010" to .015" each side. Step from crank pin to wrist pin held within .001".



1000 SOLE PLATES

Removing 1/8" stock from standard electric iron sole plates. Finished for buffing. Unloaded automatically, sectional magnetic chuck used.

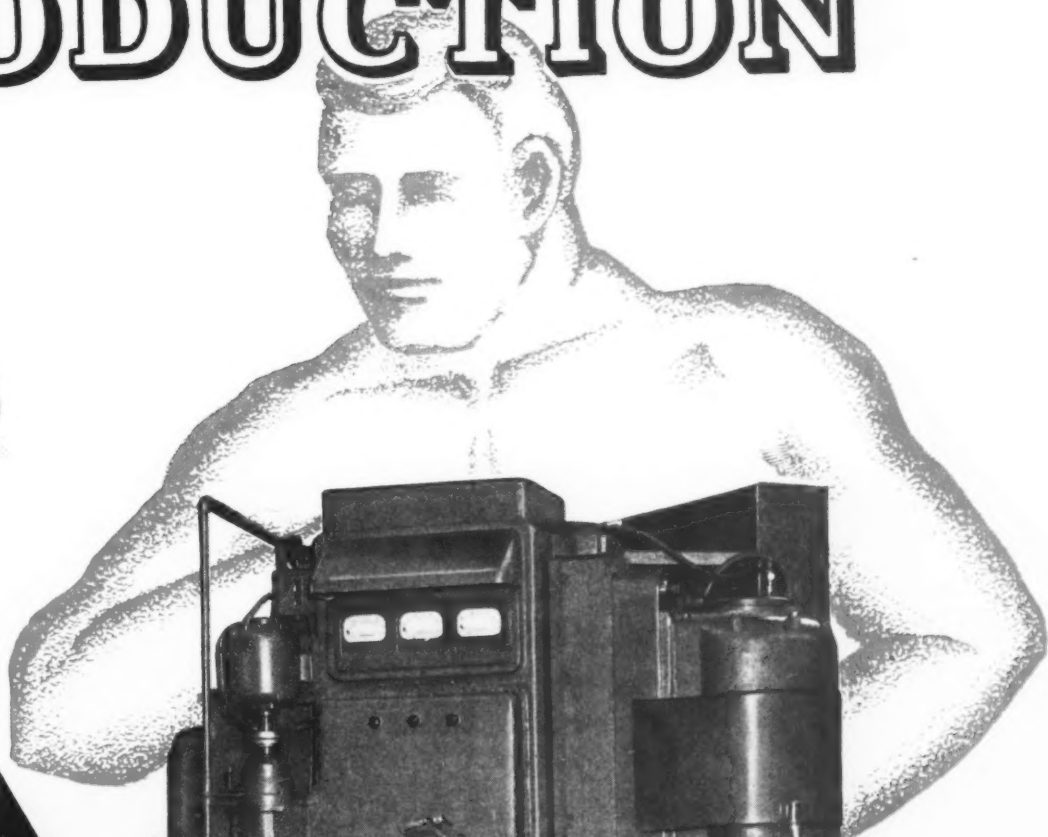
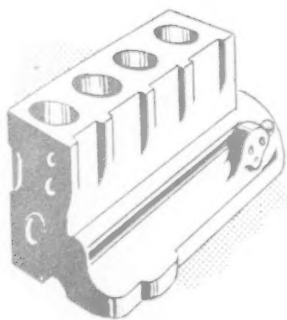


IF IT'S A FLAT SURFACE—

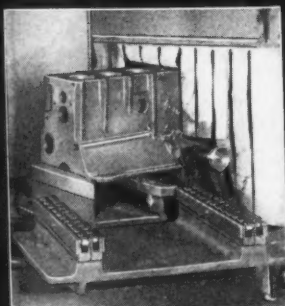
HANCHETT

B I G R A P I D S

PRODUCTION

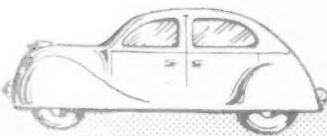


PER HOUR



120 MOTOR BLOCKS

Grinding cylinder head face surface, 6-cylinder motor blocks, 8" wide x 28" long — 150" stock removed from rough casting, flat and to size within .001".



**HANCHETT
NO. 72
ROTARY SURFACE
GRINDER**

72
HETT
DS.USA

Represented Throughout Latin America by Machine Affiliates, Inc.

THERE'S A HANCHETT TO GRIND IT



MANUFACTURING CO.

M I C H I G A N , U . S . A .

MACHINERY, March, 1946—45

"Put it on the Blanchard"

Here is another example of how the BLANCHARD increases the production of these sprocket shaft supports over the former method.

These steel forged sprocket shaft supports are ground on a No. 18 Blanchard Surface Grinder equipped with a 36" chuck. Four pieces are placed on the chuck at one time and $\frac{1}{8}$ " to $\frac{3}{16}$ " of metal is removed from each surface.

They are ground at the rate of 10 per hour, whereas only $2\frac{1}{2}$ pieces were produced per hour by the former method of production.

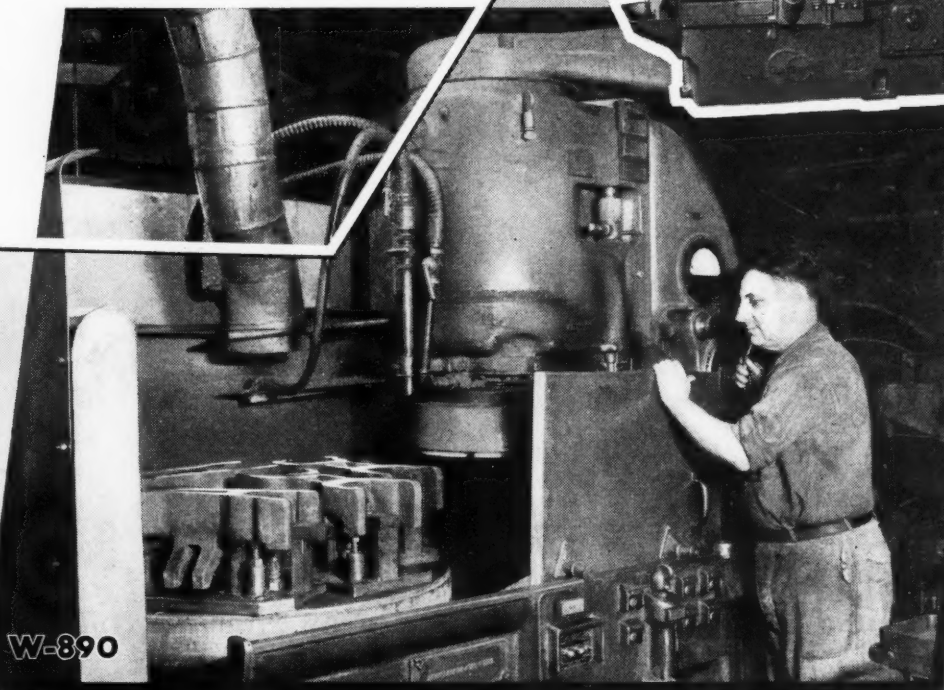
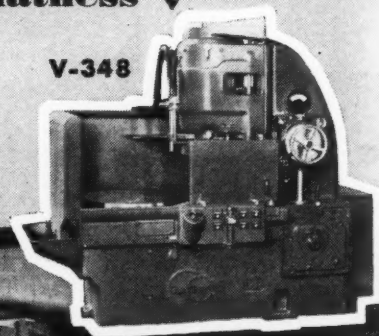
When surfaces must be flat and parallel, "put it on the Blanchard" and increase production.

GET THESE

ADVANTAGES

Production ✓
Adaptability ✓
Fixture Saving
Operation Saving
Material Saving
Close Limits
Fine Finish
Flatness ✓

V-348



W-890

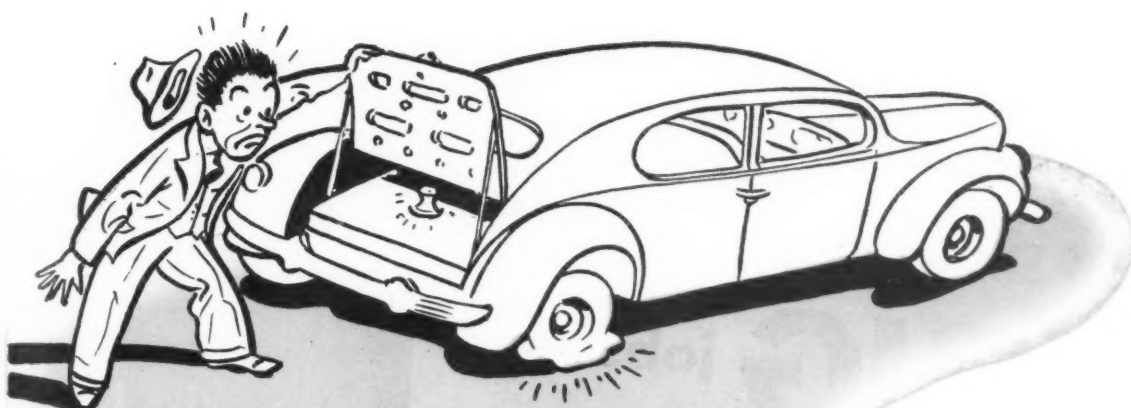


Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.



The **BLANCHARD** MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.



WOULD YOU DRIVE WITHOUT A *Spare?*

"Just my luck! A flat tire and no spare! What a predicament!"

A machine shop foreman may be in a worse predicament without a spare arbor. When an arbor breaks, production ceases until the arbor is replaced. Machine and manpower hours wasted! Schedules disrupted! Deliveries delayed! That's why we say —

It Pays to Have Several Arbors in Stock

Arbors are "perishable tools" and today their cost is relatively small in comparison to lost hours and disrupted schedules. So play safe! Order your spare arbors today. Remember, Kempsmith Arbors are now available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle.

THE KEMPSMITH MACHINE CO. • 1821 S. 71st Street • Milwaukee 14, Wisconsin



Get Your Copy of this NEW ARBOR BULLETIN

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.

Arbors
BY KEMPSMITH

Precision Built Milling Machines Since 1888

**Write
Today!**


KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME.....TITLE.....


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always specify
CLE•FORGE ^{HIGH SPEED} DRILLS
 for the **BIG** jobs



● For every drilling operation, there's a CLE•FORGE Drill, no matter how large or small, to do the job *better* and *at lower cost*. It pays to look for the  trade-mark not only on Twist Drills but also on Reamers, Screw Extractors, Arbors, Mandrels, Sockets, Mills and Counterbores.

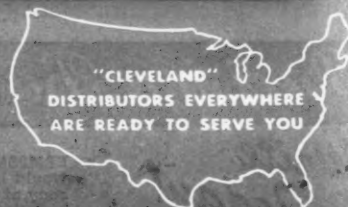


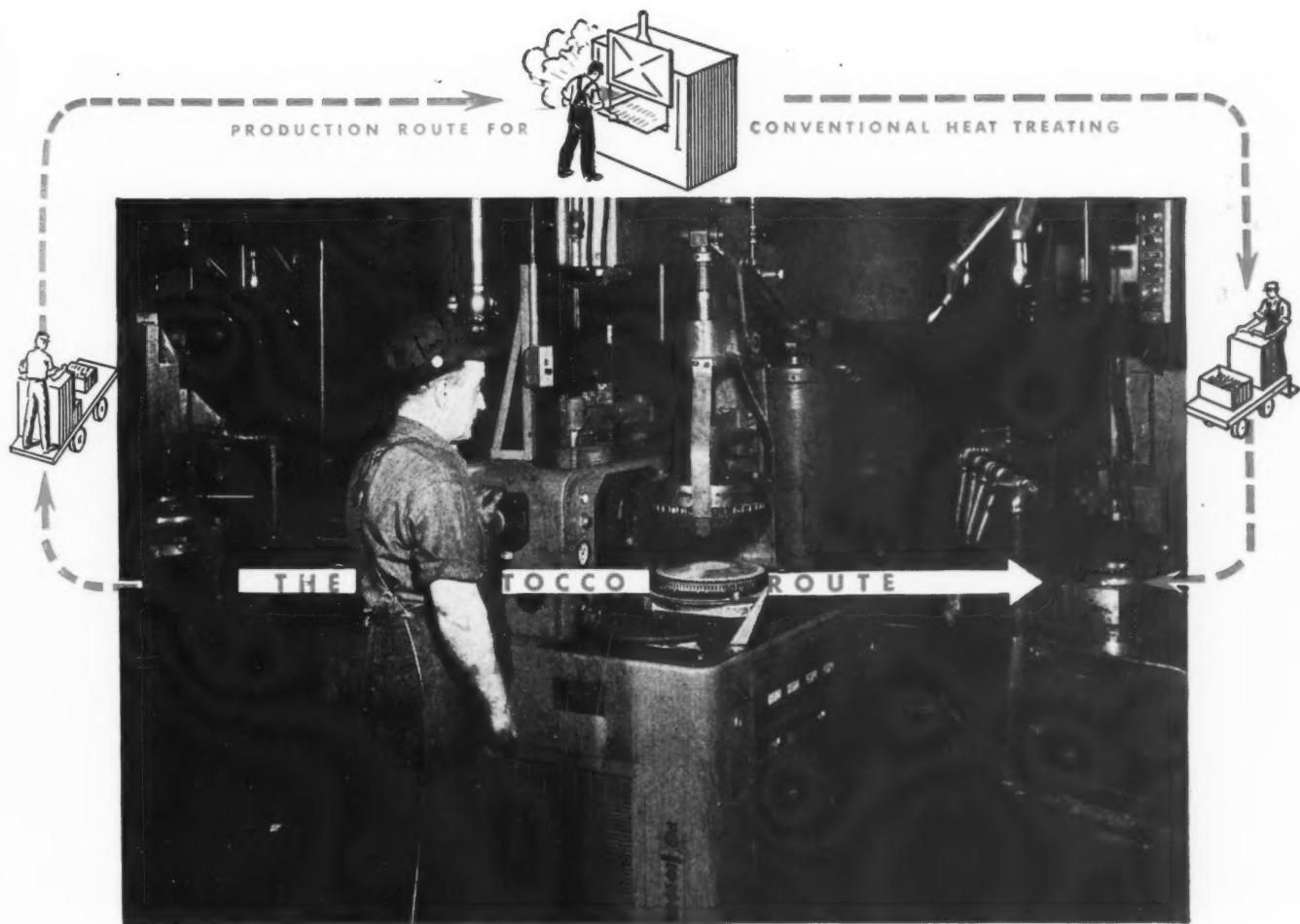
Telephone YOUR  FIRST!

The **CLEVELAND** TWIST DRILL COMPANY
 1242 EAST 49th STREET
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TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES
 20 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 630 HOWARD ST., SAN FRANCISCO 5
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"CLEVELAND"
 DISTRIBUTORS EVERYWHERE
 ARE READY TO SERVE YOU





WHY ISOLATE YOUR *HEAT TREATING?*

WILLYS-OVERLAND MOTORS, Inc., reports this time-saving idea in the manufacture of flywheel ring gear assemblies for the famous Jeep:

A compact, cool, clean TOCCO machine—used for shrink-fitting—is spotted between two automatic lathes which perform related operations. Conventional heating practice . . . cumbersome, hot and dirty . . . would have required isolation of the shrink-fitting operation and a costly production detour. The handy TOCCO set-up allows this efficient procedure:

The man shown in the picture machines one side of cast iron flywheel in machine at left . . . places it and ring gear in TOCCO work fixture . . . presses

TOCCO start button.

The TOCCO machine automatically heats ring gear to 400°F. in 12 seconds, expanding its 12" diameter .025" . . . lowers ring gear and presses it on flywheel . . . quenches ring gear, cooling and shrink-fitting it to flywheel.

A second man removes the assembly from TOCCO and machines other side of flywheel in machine at right.

Since TOCCO almost operates itself, only two men are required for this three-machine set-up.

Find out how TOCCO can solve many of your production problems. The book, "Results with TOCCO," will be sent free on request.

THE OHIO CRANKSHAFT COMPANY • CLEVELAND 1, OHIO



TOCCO

INDUCTION
HARDENING..BRAZING
ANNEALING..HEATING

*Are You Cutting Metals and
Non-metals the Modern Way...*

NORTON COMPANY
ALUNDUM
WORCESTER MASS. U.S.A.

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NORTON ABRASIVES

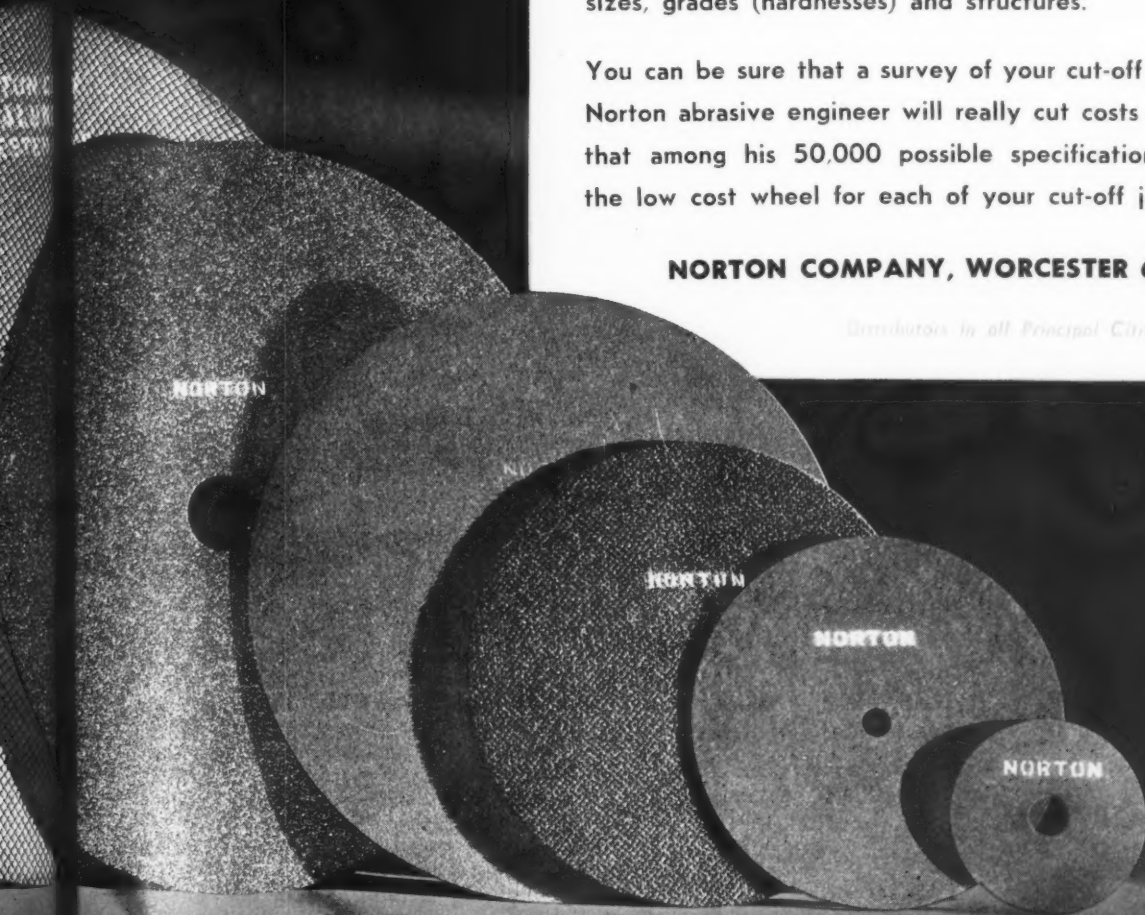
... with NORTON *Cut-off* WHEELS?

WHEN a Norton abrasive engineer tackles your cut-off jobs he's not limited to one special type of wheel. He has a complete line to choose from—over 50,000 possible specifications. For example, he has several varieties of resinoid bond, both natural and synthetic rubber bond, and shellac bond. He has Alundum, 57 Alundum and Crystolon abrasives. And in each abrasive and bond he has a wide range of grit sizes, grades (hardnesses) and structures.

You can be sure that a survey of your cut-off jobs by a Norton abrasive engineer will really cut costs for you—that among his 50,000 possible specifications there's the low cost wheel for each of your cut-off jobs.

NORTON COMPANY, WORCESTER 6, MASS.

Distributors in all Principal Cities.

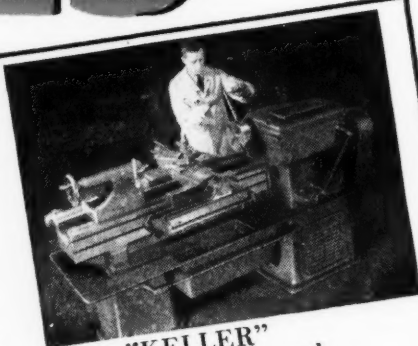


YES

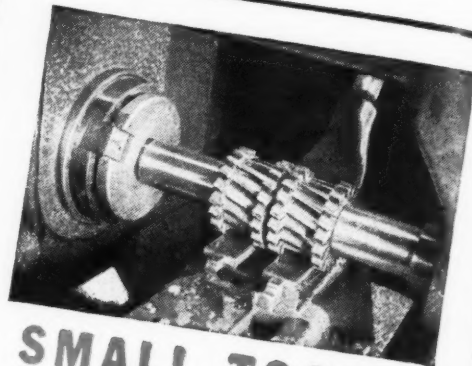
*P. & W. Precision will help you
to get finer, faster production
at lower cost!*

MACHINE TOOLS

Toolroom Lathes
Bench Lathes
Automatic Lathes
Centering
Machines
Bench Millers
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Vertical Shapers
Thread Millers
Gear Grinders
Vertical Surface
Grinders
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"KELLER"
Machines and
Electric Controls
Profilers
Deep Hole Drillers
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"KELLERFLEX"
Flexible Shaft
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Equipment



SMALL TOOLS

Taps
Dies
Screw Plates
Reamers
Milling Cutters
Carbide Tipped Tools
Burs
Rotary Files
Miscellaneous and Special Tools



GAGES

Precision Gage Blocks
Standard Measuring
Machines
Supermicrometers
Gages of all types,

both standard and
special, for manu-
facturing and in-
spection, including
electrical and pneu-
matic comparators,
cylindrical, thread,
snap, railroad and
oil country gages

We wish we could tell you in detail on this one page what each of Pratt & Whitney's products can do for you . . . how their exceptional accuracy and quality can improve your production from every angle. But the list is far too long.

The best way you can get a clear picture of how these tools and instruments will fit into your set-up is to call in a Pratt & Whitney engineer. It's his job to help with your problems . . . to suggest ways and means of speeding production, bettering quality and saving you money. Pratt & Whitney accuracy has done amazing things for many products.

If you need data on any particular Pratt & Whitney machine or tool or gage, we will be glad to send you detailed literature upon request. Remember, there is no better paying investment than the right tools for the job.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1 • CONNECTICUT





...DOUBLED GRINDING and POLISHING SPEED

This fabricator of stainless steel milk truck tanks was using universal electric tools for grinding and polishing welds.

"How can we get more output with the same man and same pay?", was the gist of the inquiry made to the Rotor Application Engineer. He replied, "With lighter, faster Rotor High Cycle Tools". He demonstrated one. Sold! Report after a year of service:

100% more output because of doubled wheel

speed under load . . . and because tool is 8 lbs. lighter and easier to handle in cramped quarters.

Lower maintenance because High Cycle tool has no brushes, commutators or wound rotors.

The Rotor Engineer will be glad to explore *your* possibilities for more output per man per dollar. Feel free to call him in.

Yours for high output,
HI-CYCLE O'TOOL



AIR

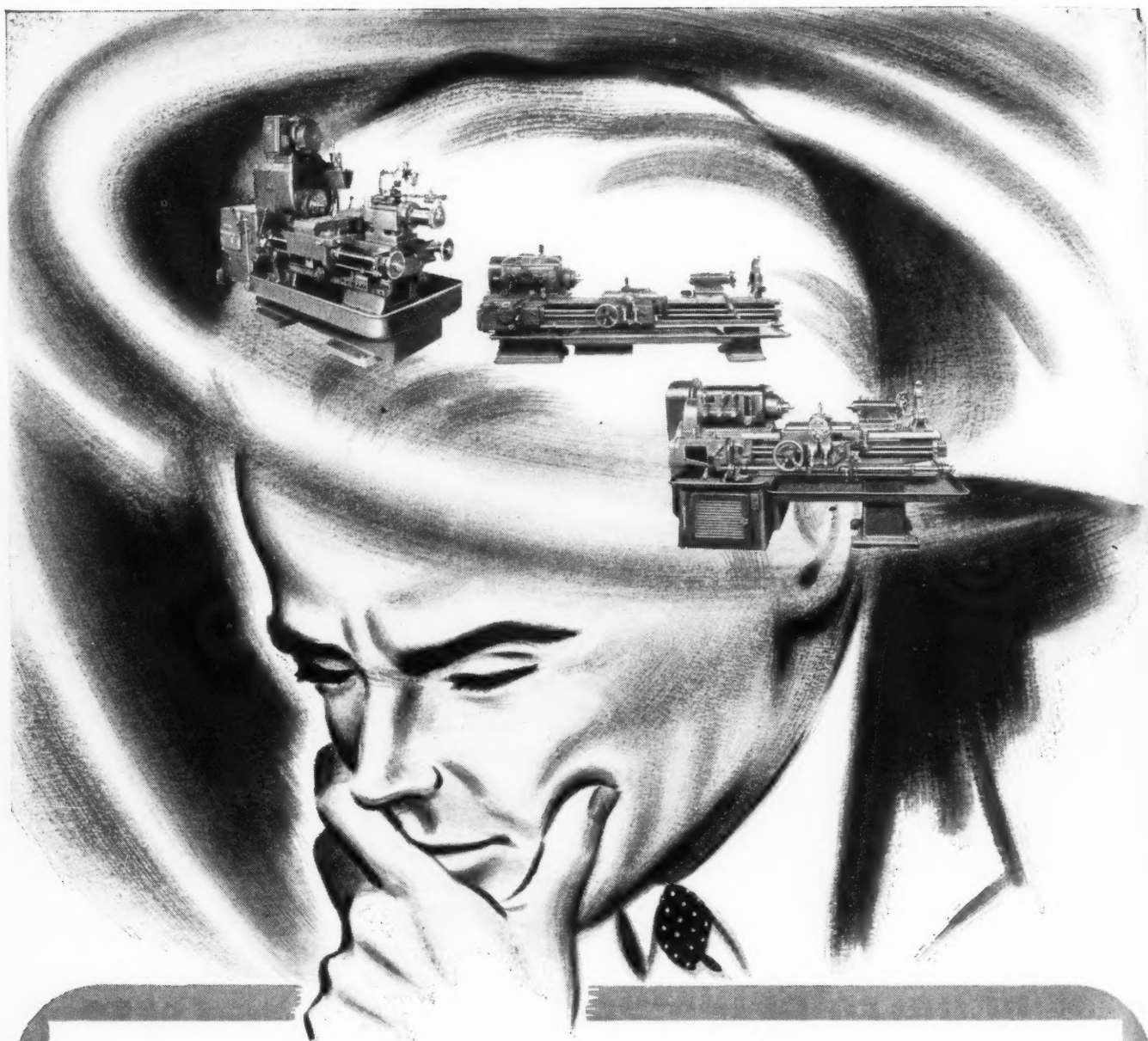
THE ROTOR TOOL CO.

CLEVELAND, OHIO

UNBIASED ANALYSIS OF PORTABLE TOOL PROBLEMS



HIGH CYCLE



IN DOUBT ABOUT YOUR LATHE EQUIPMENT?

● Maybe you've been thinking that your lathes are not putting out enough to keep higher labor and material costs in line. If they can't reduce your costs it's a sound conclusion to consider these lathes **OBSOLETE!**

Lodge and Shipley has designed engine and automatic lathes that will offset higher costs. The L & S 18, 20 and 22 inch engine lathes are revolutionary in design—entirely new and different in every part. Or consider the new 2A

and 3A Duomatics. Unskilled operators handle these automatics easily. The worker merely loads and unloads the work and starts the operation cycle. The machine does the rest.

One of these lathes may actually equal several of your older models in total output. L & S Engineers will demonstrate on your work how these lathes cut costs. Write on your company letterhead for Bulletins Nos. 500, 503, 605, (engine lathes) or Nos. 601 and 620 (for Duomatics).

THE LODGE & SHIPLEY

MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

MACHINE TOOL DIVISION 3055 COLERAIN AVE. • SPECIAL PRODUCTS DIVISION 800 EVANS ST.



3 MORE CUTS PER TOOL GRIND

 BETTER FINISH

 LONGER TOOL LIFE



EFFECTIVE cutting fluids assure these benefits. *Texaco Cutting and Soluble Oils* have proved their effectiveness on all metals and with all methods of machining. They lubricate and cool the tools, prevent chip welding, permit higher cutting speeds, reduce scrap and downtime for tool changes.

In splining, for example, one plant — by switching to Texaco — *tripled* the number of shafts cut per hob setting. This is typical of

the way Texaco cutting fluids can improve results from all forms of metal cutting.

Let a Texaco engineer trained in the proper selection and application of cutting fluids help you increase your machining efficiency. Call the nearest of the more than 2300 Texaco distributing plants in the 48 States, or write:

☆ ☆ ☆

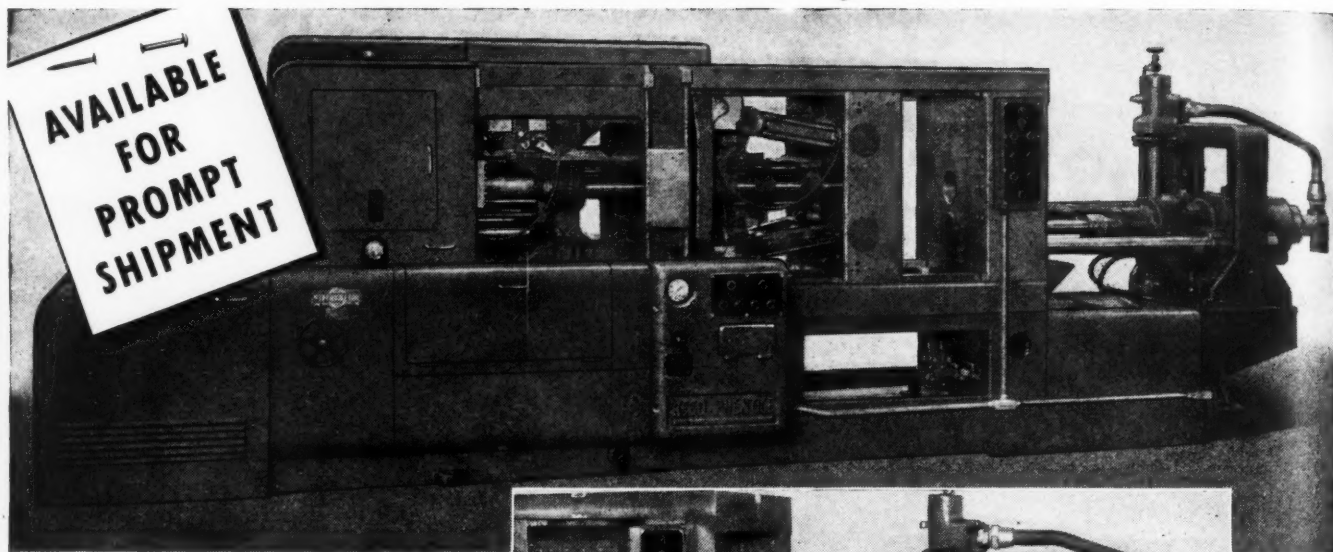
The Texas Company, 135 East 42nd Street,
New York 17, N. Y.



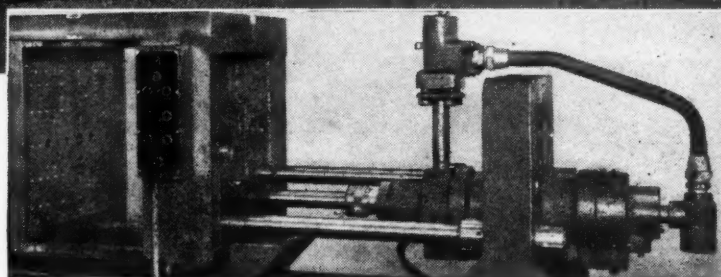
**TEXACO CUTTING, SOLUBLE AND
HYDRAULIC OILS** FOR FASTER
MACHINING

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON SUNDAY NIGHTS ★ METROPOLITAN OPERA BROADCASTS SATURDAY AFTERNOONS

MACHINERY, March, 1946—55



Close-up of metal injection end of Reed-Prentice 3G Die Casting Machine.



The **BIG** 3G... for larger die castings

from Aluminum, Magnesium or Brass Alloys!

A big machine for larger castings from aluminum, magnesium or brass alloys — capable of 400 tons die locking pressure — yet easy to operate!

Of heavy frame construction, this Reed-Prentice Die Casting Machine is equipped with the most modern safety devices and convenient centralized controls. Some of the features include positive die locking mechanism, hydraulic circuit, electric timing, automatic ejection, automatic lubrication of moving parts and built-in water cooling system.

Engineered for easy accessibility in maintenance — all piping, electric controls and hydraulic equipment are mounted outside the base of the machine.

Size of die plates	30" x 30"	Clearance—top and bottom beams	29"
Maximum die thickness	24"	Opening through beams, width	18"
Minimum die thickness	12"	Motor required, 1200 RPM	30 H. P.
Die opens	16"	Approximate weight	24,200 lbs.



★ ★ ★ ★ ★
NEW YORK OFFICE:
75 West St., New York 6, N. Y.



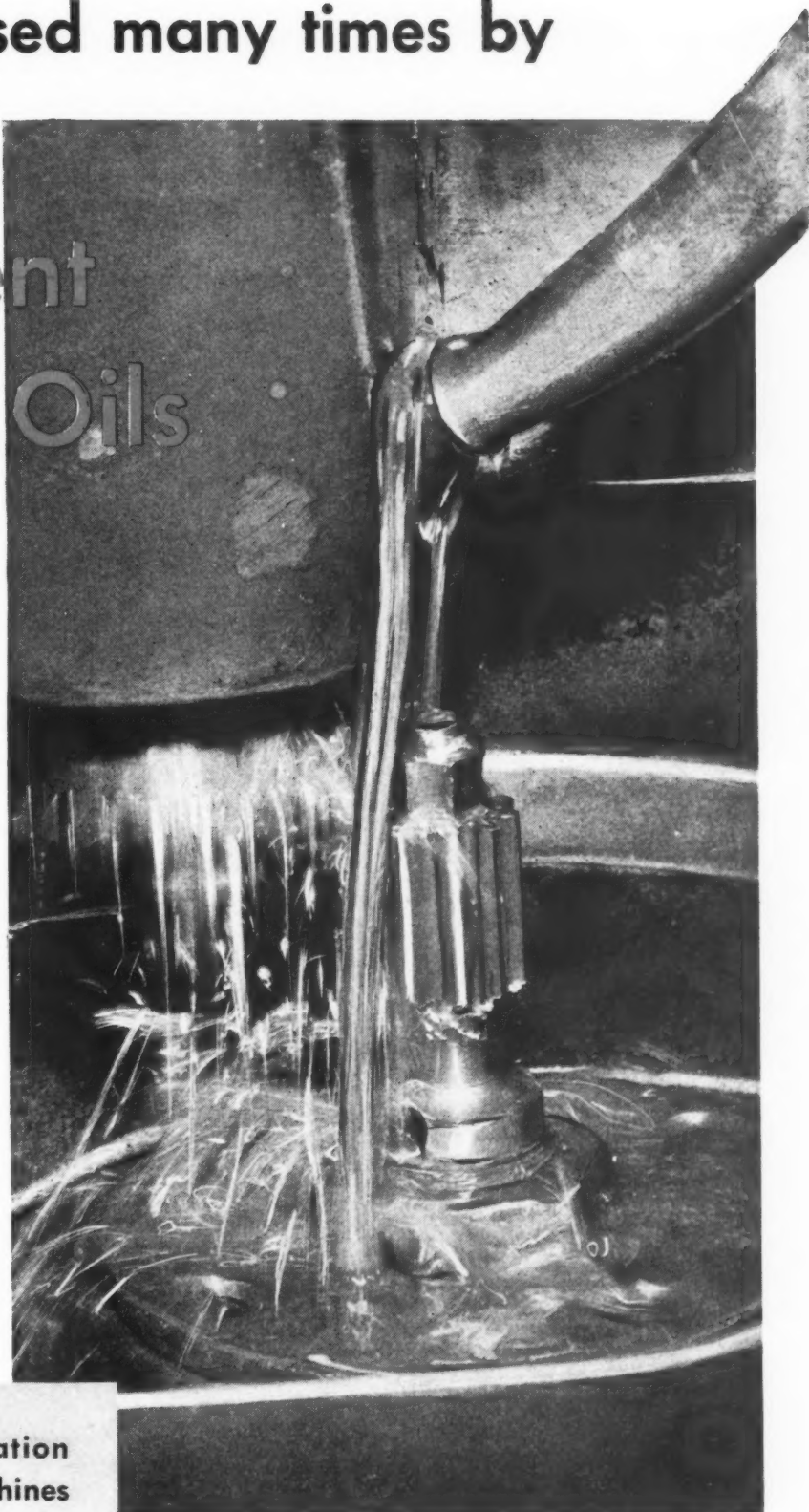
★ ★ ★ ★ ★
CLEVELAND OFFICE:
1213 W. 3rd St., Cleveland 13, Ohio

Tool Life increased many times by New Transparent Cutting Oils

TRANSSPARENT, light-colored, odorless and containing a powerful new lubricity agent, Socony-Vacuum's revolutionary new Sultran Oils not only permit better visibility and better working conditions, but also far longer tool life, increased production, improved finish and lower over-all production costs.

Reports from exhaustive field tests show tool wear reduced 25 percent on some applications, and more than 500 percent on certain gear-shaping operations such as shown in the picture. Additional outstanding characteristics include: less sensitivity to variations in the hardness and structure of metals and the speeds of cut; improved "drainability" for lower oil consumption.

The new S/V Sultrans are available now for your cutting operations. Get performance facts and then get these great new oils from your Socony-Vacuum Representative.



Get this Complete Lubrication Program for all your machines

- Lubrication Study of Your Entire Plant
- Progress Reports of Benefits Obtained
- Recommendations to Improve Lubrication
- Lubrication Schedules and Controls
- Skilled Engineering Counsel



Socony-Vacuum Oil Company, Inc.

and Affiliates: Magnolia Petroleum Company,
General Petroleum Corporation of Calif.

TUNE IN "INFORMATION PLEASE" — MONDAY EVENINGS, 9:30 E.S.T. — NBC

MACHINERY, March, 1946—57

NO OTHER

Precision Pump

COSTS SO LITTLE

Only \$35.00 or less

This McIntyre Series 100 *precision* gear-type pump . . . for capacities from $\frac{1}{4}$ GPM to 3 GPM at pressures from 0 to 1000 psi for oil or 0 to 200 psi for water at speeds up to 3000 rpm . . . puts accurate performance into the smallest space. Yet it costs no more than larger pumps made to less exacting specifications.

McINTYRE PRECISION

Because McIntyre machining methods are *capable of holding flat surfaces to one light band and vital dimensions to a plus or minus tolerance of .000025"*, it is routine instead of special production when McIntyre makes precision pumps and fluid motors carrying the light-band trade-mark. That's why they cost so little.

APPLICATION FACTS

Bulletin 425 . . . describing how center plates and spur gears of different widths determine capacity . . . how they handle even corrosive liquids . . . how adapters fit all drives . . . suggests how McIntyre Model 100 precision pumps can improve performance of washing machines, dish washers, machinery control mechanisms, pressure lubrication, circulation systems for coolants, cutting oils and other fluids, and aircraft hydraulic systems. Write for your copy, specifying intended application. The McIntyre Co., 15 Riverdale Ave., Newton 58, Mass.



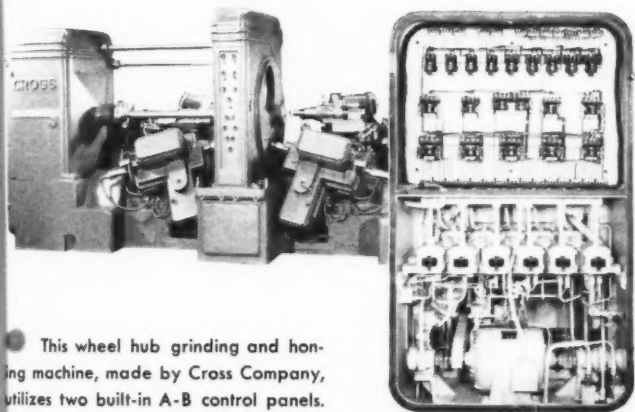
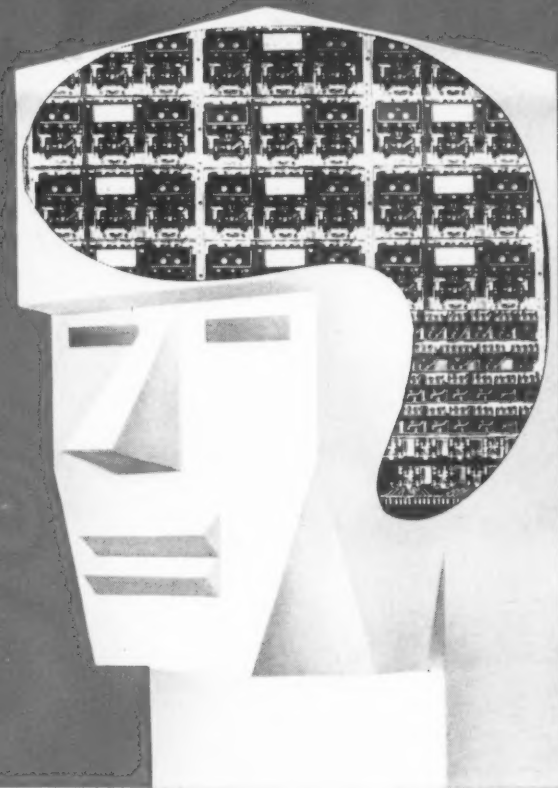
THE McINTYRE CO.
(FORMERLY ZENITH ASSOCIATES)
PUMPS AND FLUID MOTORS

THE ULTIMATE IN PRECISION

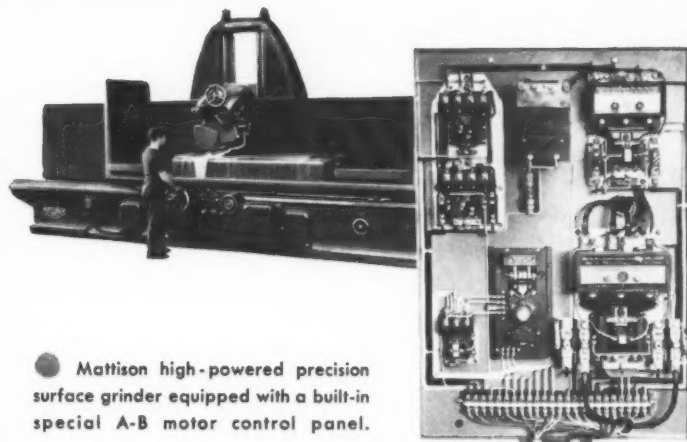
IDENTIFIED BY THE LIGHT BAND

Install a Modern "Electric Brain" on Your Machines

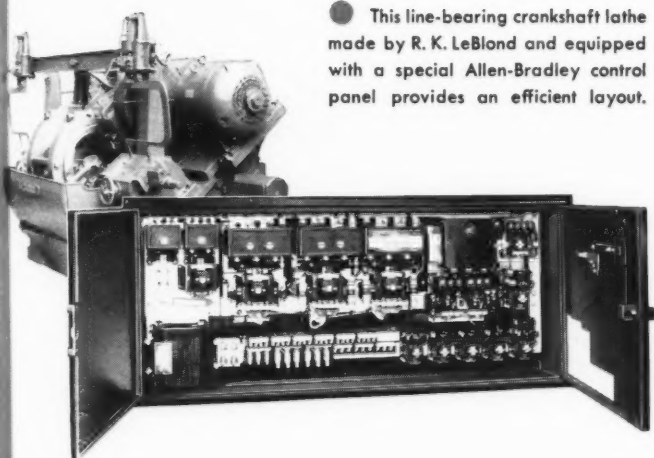
The "Electric Brain" of the modern machine is the motor control panel. Simply push a button and the electric controls provide the correct automatic sequence operation—it speeds operations and minimizes errors. Allen-Bradley engineers will gladly study your control problems—usually the answer can be found in an assembly of standard control units. Write today!



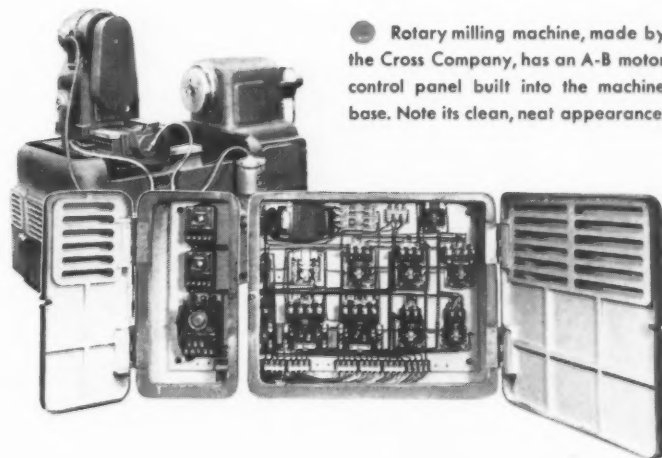
● This wheel hub grinding and honing machine, made by Cross Company, utilizes two built-in A-B control panels.



● Mattison high-powered precision surface grinder equipped with a built-in special A-B motor control panel.



● This line-bearing crankshaft lathe made by R. K. LeBlond and equipped with a special Allen-Bradley control panel provides an efficient layout.



● Rotary milling machine, made by the Cross Company, has an A-B motor control panel built into the machine base. Note its clean, neat appearance.



Let **ALLEN-BRADLEY**
QUALITY
design your Special
MOTOR CONTROL PANELS

It's the Moving Parts that Give Trouble

1 Moving Part—1 Chance for Trouble

2 Moving Parts—2 Chances for Trouble

4 Moving Parts—4 Chances for Trouble

20 Moving Parts—20 Chances for Trouble



Only 1 Moving Part in Allen-Bradley Solenoid Starters



It's the amazing simplicity of the Allen-Bradley solenoid starter that makes it so trouble-free. The only moving part is the simple plunger which carries the movable contacts. There are no pins, pivots, or bearings to corrode and stick...no flexible jumpers to break. And the double break, silver alloy con-

tacts never need filing, cleaning, or dressing. With an Allen-Bradley solenoid starter you can get millions of trouble-free operations. Just install this starter...and forget it!

Allen-Bradley Company
1316 South Second Street, Milwaukee 4, Wis.

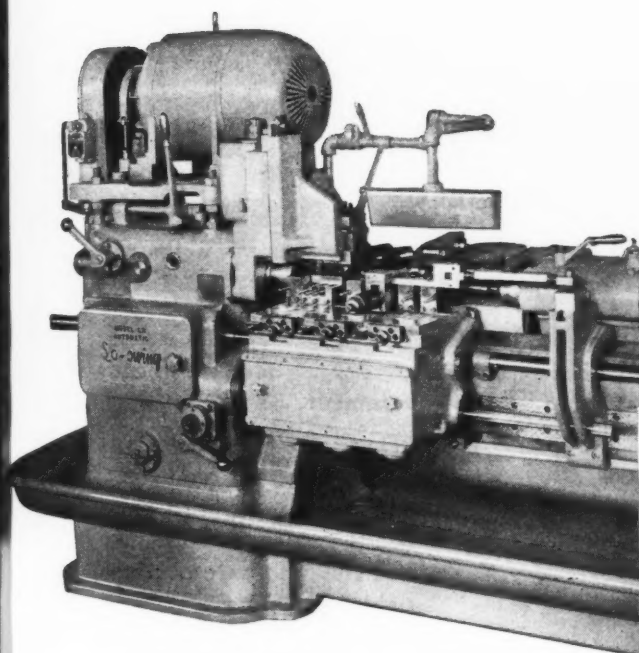
Right—Bulletin 709 across-the-line solenoid starter. Note its attractive appearance, white cabinet interior, and generous wiring space.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

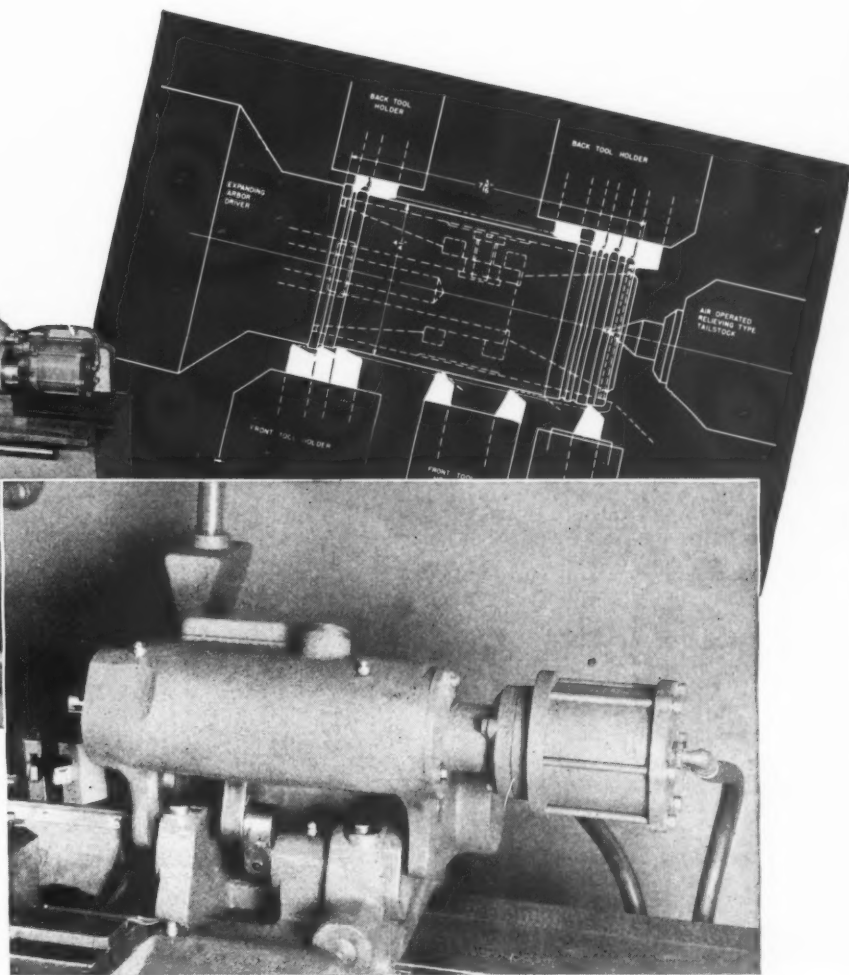


MACHINE OF THE MONTH

PREPARED BY THE SENECA FALLS MACHINE CO. "THE Lo-swing PEOPLE" SENECA FALLS, NEW YORK



CYLINDER LINER PRODUCTION SPEEDED WITH MODEL LR *Lo-swing* LATHE



PROBLEM: To automatically turn outside diameters, face and groove cast iron Cylinder Liners of various types with Carbide Tools.

SOLUTION: The Model LR Automatic Lo-swing Lathe, was selected for the following reasons: (1) demonstrated fine performance with carbide tools; (2) ease of setting-up with its **SIMPLIFIED CHANGE-OVER MECHANISM**; and (3) ease of loading and unloading with the **RELIEVING TAILSTOCK** which also reduces overhang of the tailstock spindle to a minimum.

The cast iron cylinder liners are delivered to the Lathe with the bore machined to size and the large end faced. They are held and driven with an air-operated, expanding collet arbor which extends the full length of the piece, thus assuring a large area of driving surface which permits high cutting speeds and coarse carriage

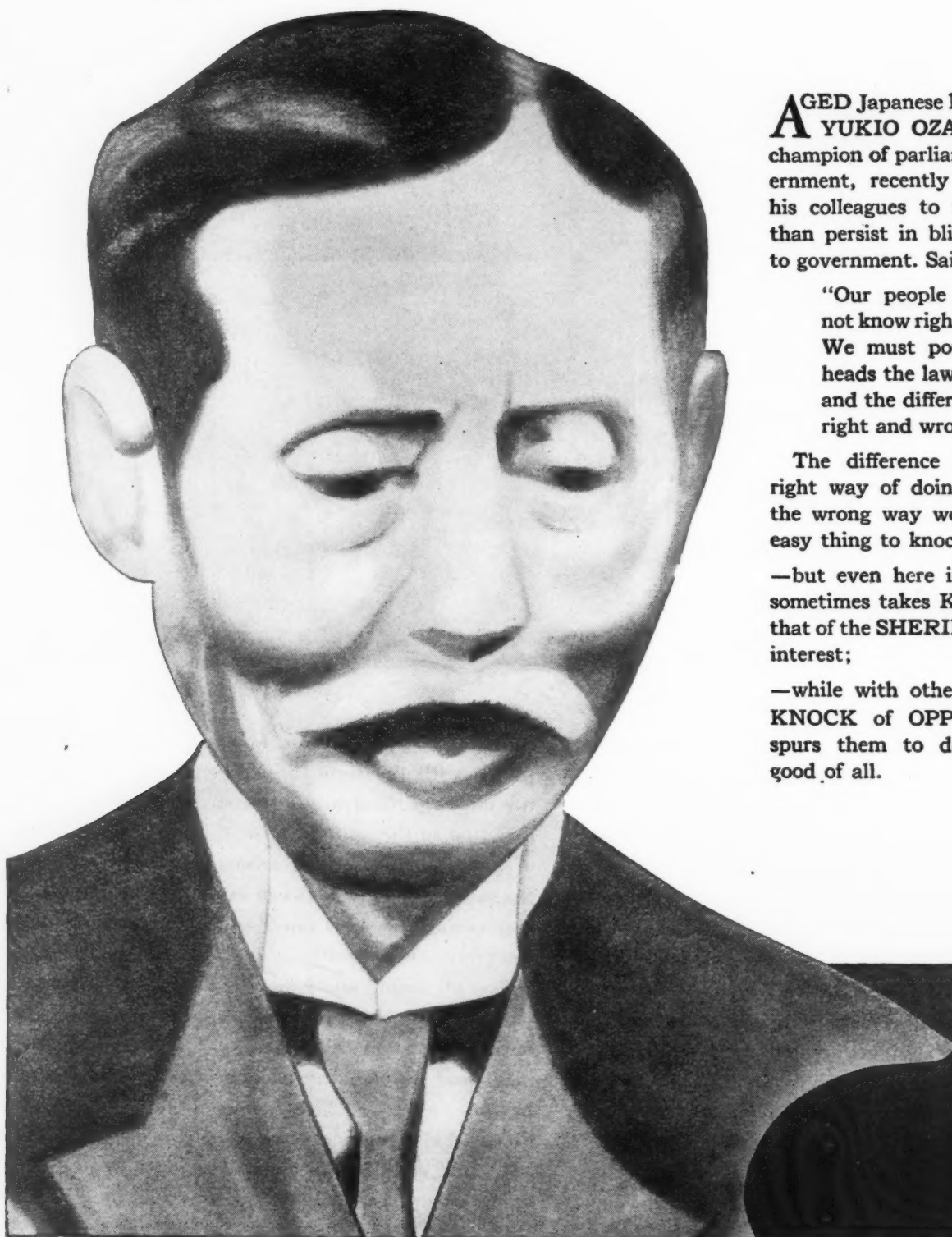
feeds for fast production. Loading of the parts is simplified with the Relieving Type Tailstock, shown in the close-up illustration and since the driving arbor is bolted to the spindle nose, the operator is relieved of handling heavy stub arbors generally used when the parts are held between centers. The outside diameters and the short taper on the tailstock end of the liners are turned with six tools mounted on the front slides; all facing and grooving operations are accomplished with tools mounted on the rear slide. The entire operation is automatic—the operator simply loads and unloads the parts and pushes the starting button.

Seneca Falls engineers are always at your disposal to help find solutions for any of your difficult turning operations.

LATHE NEWS from SENECA FALLS

then he said to himself:

"Beat their brains IN...not out"



AGED Japanese Diet member, **YUKIO OZAKI**, lifelong champion of parliamentary government, recently called upon his colleagues to resign rather than persist in blind obedience to government. Said he:

"Our people of today do not know right from wrong. We must pour into their heads the law of humanity and the difference between right and wrong."

The difference between the right way of doing things and the wrong way would seem an easy thing to knock into heads, —but even here in America it sometimes takes **KNOCKS** like that of the **SHERIFF** to awaken interest;

—while with others the gentle **KNOCK** of **OPPORTUNITY** spurs them to deeds for the good of all.



The difference between RIGHT and WRONG . . . *he says*

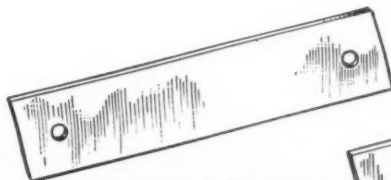
LOOK, OZAKI . . . Here is the difference between RIGHT and WRONG in manufacturing a bracket such as shown:

WRONG:

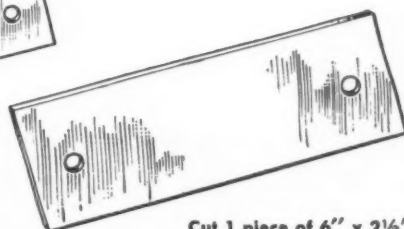


Cost 13¢ each
of conventional construction.

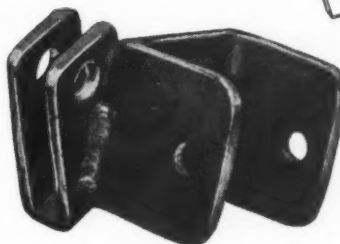
RIGHT:



Cut 1 piece of 6" x 1½"
x ¼" strap. Drill holes
in ends. Bend in U.



Cut 1 piece of 6" x 2½"
x ¼" strap. Drill holes
in ends. Bend in U.



Fit up in jig and weld on
both sides.

Cost 8¢ each
of welded steel.

DIFFERENCE: Saved 5¢ Each

This bracket, 10 of which are used on each harrow, is typical of many parts changed over to welded design by an implement manufacturer. Perhaps your product has similar parts. The Lincoln Engineer will gladly help you study the possibilities of welded design as applied to your problems.

STUDIES IN MACHINE DESIGN . . . issued periodically. Free on request. Ask for them on your business letterhead.

THE LINCOLN ELECTRIC COMPANY
DEPT. J-1 CLEVELAND 1, OHIO

The RIGHT Ways to Control Distortion

The new Lincoln sound-color movie, "The Prevention and Control of Distortion in Arc Welding", by Walt Disney Productions, explains simply and clearly the causes and cures of distortion. A valuable aid to designers and production men. Available free for showing to groups. Ask for Bul. 709.

America's greatest natural **recourse**
ARC WELDING

Engineered Hole Location Service Brings Interchangeability to Toolmaking

Complex tools and dies can now be produced like automobile parts—on an interchangeable parts and assembly basis—with the Moore Jig Borer and Moore Jig Grinder working together as toolroom partners.

Moore Jig Borer Spots • Drills • Bores or Reams all Holes with Minimum Tool Changes

Moore Jig Grinder Relocates Holes in Hardened Parts by Finish-Grinding

With both machines working to pre-engineered dimensions, die, stripper and punch plates can be made *concurrently* by several toolmakers instead of progressively as a one-man job. And greater accuracy and economy are achieved. Here's how:

Both the Moore Jig Borer and Jig Grinder employ lead screw measuring principle and convenient system of coordinate hole location. Lead screws hardened and ground to .0002" over 14" of travel and within .00005" in any given inch are built into the machines...assure precise, rapid table settings within .0001".

Coordinate calculations, made by engineering department, are used throughout—in bor-

ing the soft pieces and finish-grinding the hardened parts. All work is done to figures instead of to "fit"—promotes greater accuracy and saves operator's time.

Parts are made concurrently. Errors in hardened pieces are corrected, *not transferred* to other parts. This permits several toolmakers to work on the job at once, speeding die delivery to your press room.

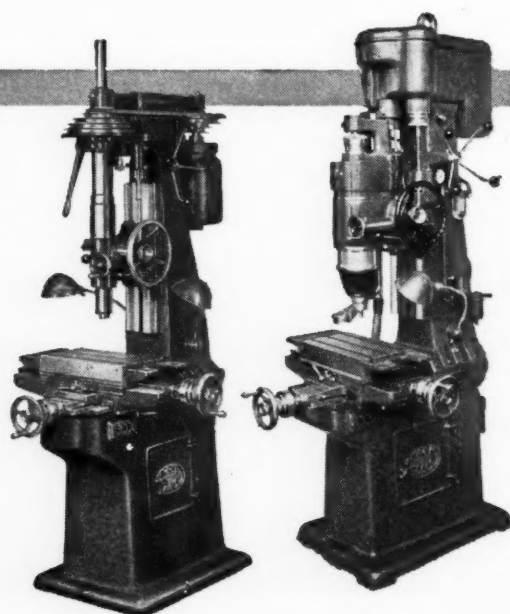
Both machines inspect own work before removal from the machine. By simply inserting a dial indicator in place of the boring or grinding tool and resetting the micrometer lead screws to the original specification, errors in earlier settings are immediately apparent and readily corrected without disturbing the set-up.

Mass-die-production has many other advantages...saves over-all toolmaking hours...lowers tool costs...increases toolroom capacity...prolongs tool life.

Why not investigate how this Engineered Hole Location Service can increase the productivity of your toolroom and production methods. Write today—

MOORE SPECIAL TOOL COMPANY, INC.
734 UNION AVENUE, BRIDGEPORT 7, CONNECTICUT

**MOORE
JIG
BORER**

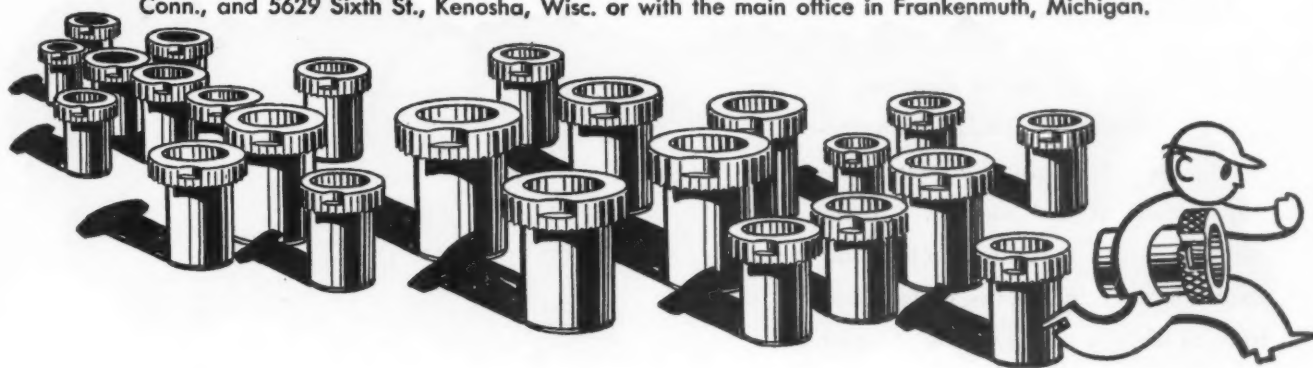


**MOORE
JIG
GRINDER**

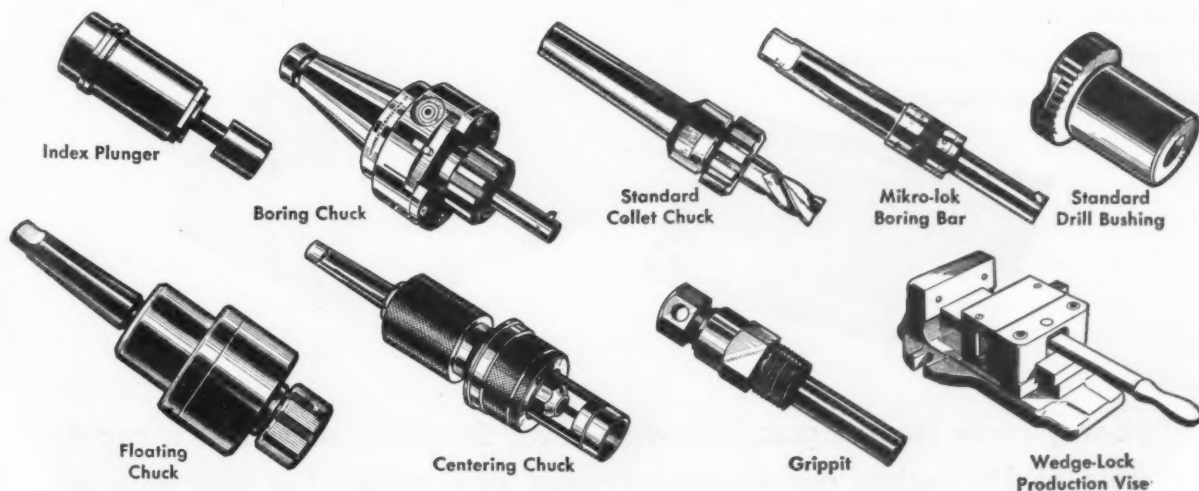


300,000 UNIVERSAL DRILL BUSHINGS NOW ON HAND FOR IMMEDIATE DELIVERY • TWO NEW UNIVERSAL WAREHOUSES ASSURE PROMPT SERVICE . . .

Universal Drill Bushings—superhoned and precisely finished straight and round to within .0001"—are now available in large quantities for immediate delivery to speed production reaming, drilling, and tapping operations in your plant. On hand in the two big, modern Universal warehouses strategically located in Kenosha, Wisc., and Ansonia, Conn., are 300,000 standard press fit and renewable bushings of unsurpassed accuracy and durability. As an added service to your production requirements, these Universal warehouses offer teletype service direct to the main Universal offices in Frankenmuth, Mich., where your orders for special drill bushings, Universal chucks and boring bars and other production tools and replacement parts will receive immediate attention. For prompt delivery of drill bushings or any of the superior Universal tools illustrated, get in touch with the Universal Engineering Sales Co. warehouse nearest you: 89 Main St., Ansonia, Conn., and 5629 Sixth St., Kenosha, Wisc. or with the main office in Frankenmuth, Michigan.



UNIVERSAL TOOLS THAT WILL INCREASE PRODUCTION AND EFFICIENCY IN YOUR PLANT.



UNIVERSAL ENGINEERING CO.

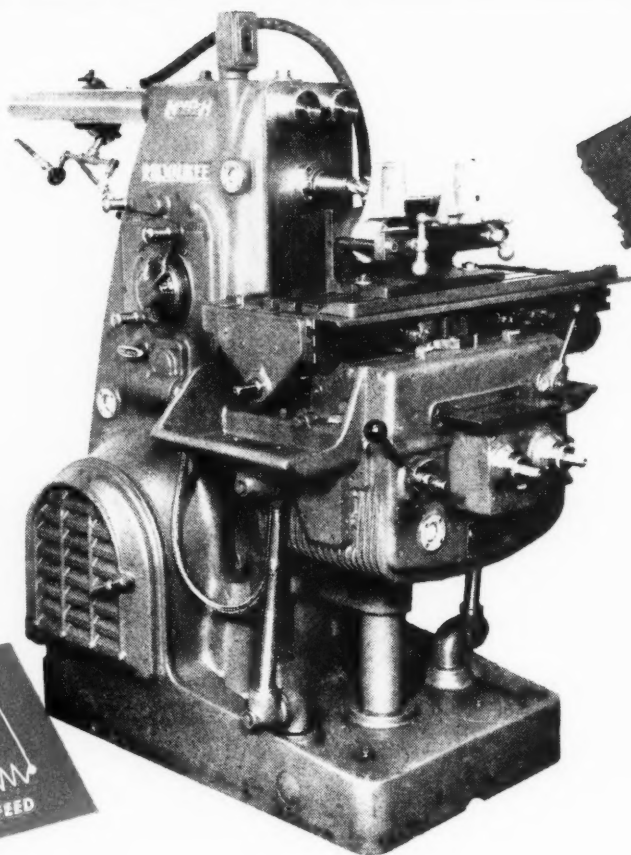
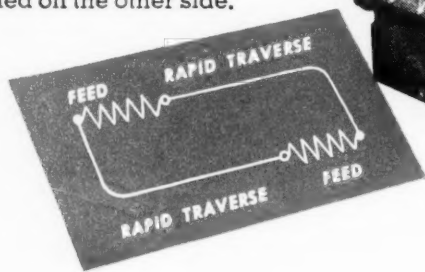
FRANKENMUTH, MICHIGAN

MACHINERY, March, 1946—65

★ **F A S T W O R K O N A**

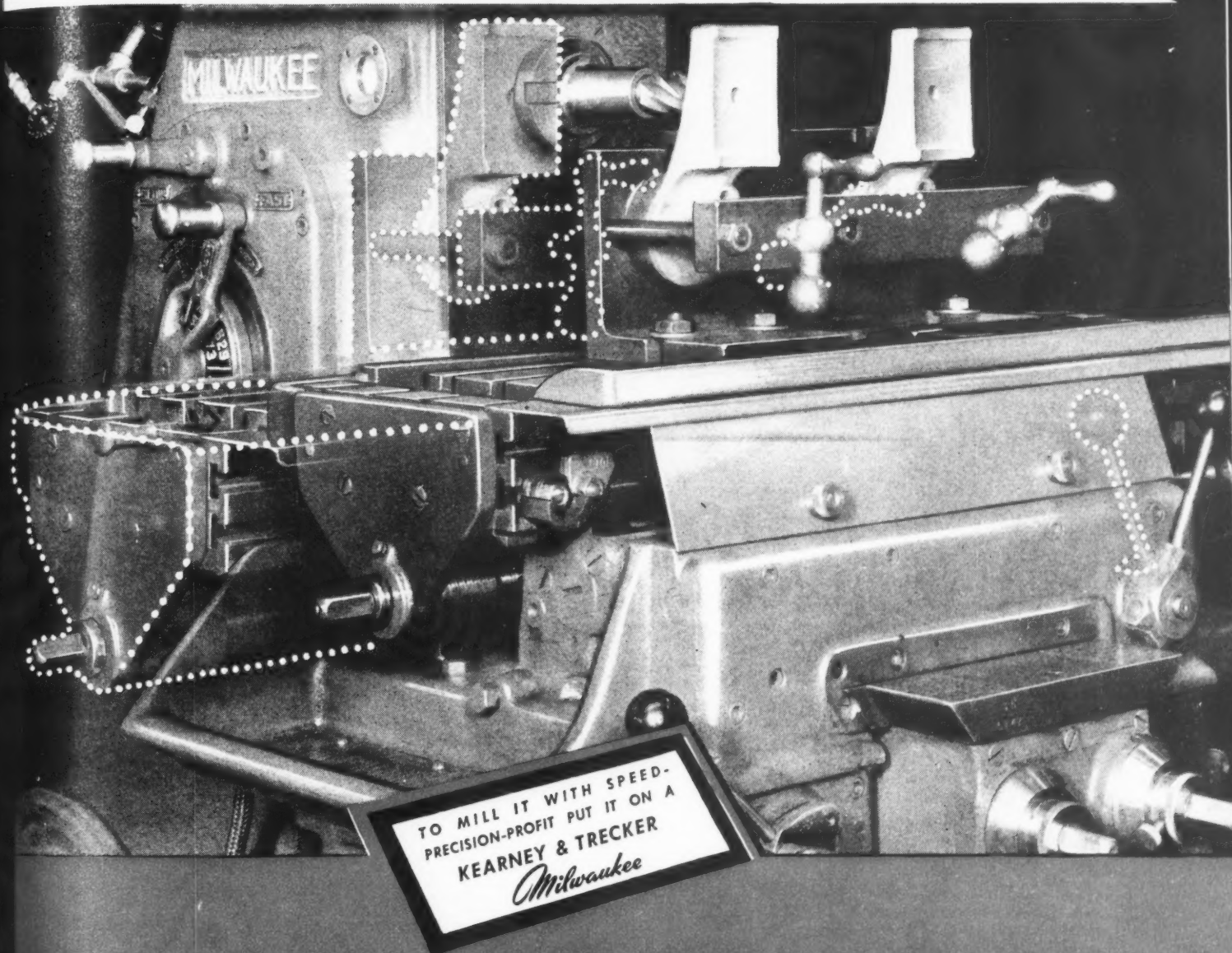
**LOW-COST PRODUCTION
MILLING OF A WIDE RANGE
OF SMALL OR MEDIUM SIZE
WORK PIECES**

In this operation on a Kearney & Trecker Milwaukee 1H-12" Manufacturing Milling Machine a boss is being milled on the back of a table saddle. A two-station hand clamping fixture is mounted on the table. Continuous table movement in a two-way cutting cycle is governed by the automatic hydraulic control system. The holding fixture is simple and efficient, providing for easy and fast loading as well as unloading and loading on one side of the fixture while the milling operation is performed on the other side.



In the two-way cycle (see diagram) shown above, the table moves at a rapid traverse rate of 150 inches per minute between cuts where the feed rate is 3.5 inches per minute. These cycles are regulated by the machine's automatic hydraulic control system. The cycle can be interrupted by the operator's hand control at any point in the cycle.

KEARNEY & TRECKER



Ease of operation, accuracy, speed and low-cost-per-piece production are the advantages that make No. 1H 12" and 18" Manufacturing Type Milling Machines so efficient for light milling operations. Extremely versatile, either manually or automatically controlled, they are readily adapted to long or short runs and capable of a diversity of milling operations on light and small or medium sized pieces.

Fast, low-cost production and exceptional

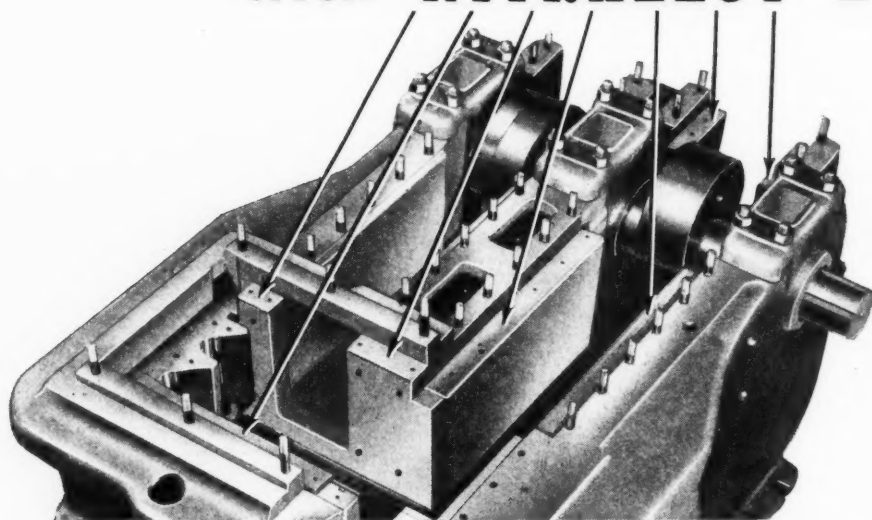
ease of operation are achieved through these Milwaukee design features: complete automatic hydraulic controls for one or two-way cutting cycles; climb cutting screw and adjustable nut for climb milling operations; automatic spindle stop and reverse rate selectors.

Write for complete information on the 1-H Series and the entire Kearney & Trecker line of more than 70 models of milling machines.

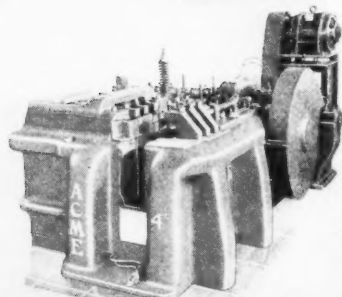
KEARNEY & TRECKER CORPORATION
MILWAUKEE 14, WISCONSIN



Permanent Accuracy Assured with **NITRALLOY** Liners



on ALL ACME XN Forging Machines



Six years of operating tests under grueling conditions of war production have proven the superiority of Nitralloy liners on the vital header and die slides of ACME XN Forging Machines. Nitralloy surfaces do not have the tendency to "pickup" common to other hardened and ground bearing surfaces and they resist the normal abrasive action of scale and water. The result is permanent alignment of the tool and die assuring the continuous peak performance of ACME XN Machines. Nitralloy liners are now standard equipment on ALL models of ACME XN Forging Machines — Just another instance of ACME XN superiority of design.

THE HILL ACME COMPANY

ACME MACHINERY DIVISION • 4535 St. Clair Ave. Cleveland 14, Ohio
ESTABLISHED 1882

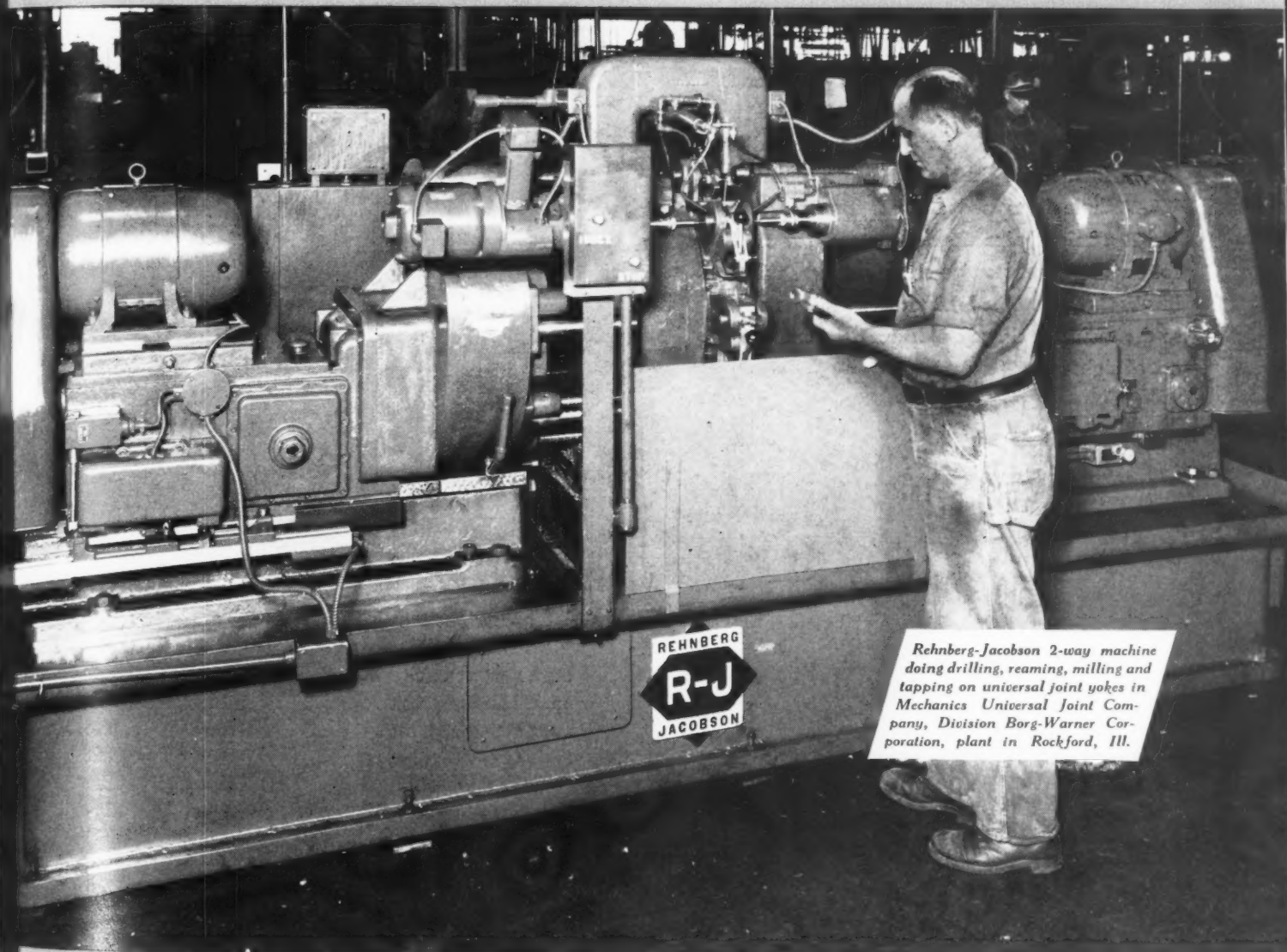
FORGING • THREADING • TAPPING MACHINES • ALSO MANUFACTURERS OF "HILL" HYDRAULIC SURFACE GRINDERS
"CANTON" ALLIGATOR SHEARS AND PORTABLE FLOOR CRANES • "CLEVELAND" KNIVES AND SHEAR BLADES

March, 1946

ROCKFORD

Metalworking

Production Ideas



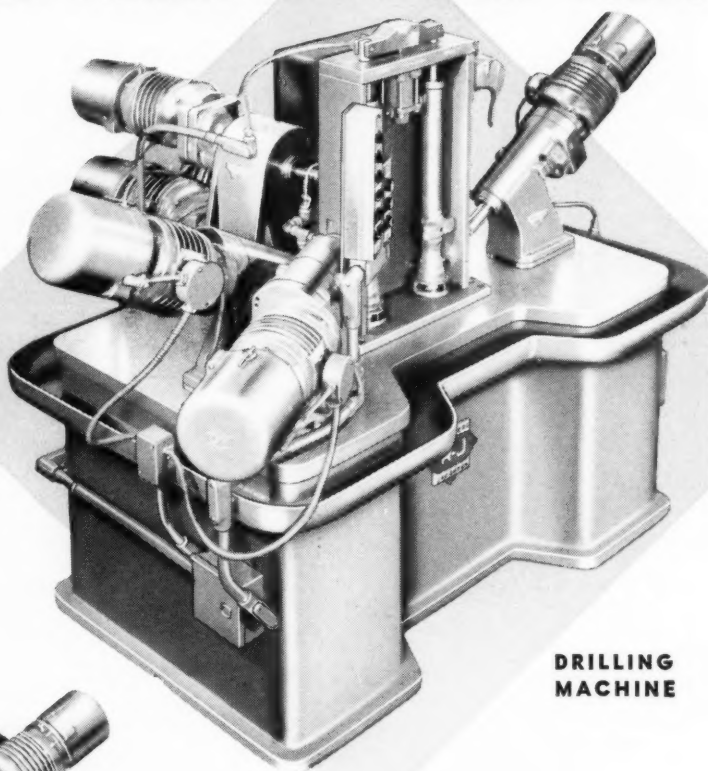
Rehnberg-Jacobson 2-way machine doing drilling, reaming, milling and tapping on universal joint yokes in Mechanics Universal Joint Company, Division Borg-Warner Corporation, plant in Rockford, Ill.

AMERICAN BROACH & MACHINE CO. ★ ANDERSON BROS. MFG. CO. ★ BARBER-COLMAN COMPANY
BARNES DRILL CO. ★ JOHN S. BARNES CORP. ★ W. F. & JOHN BARNES CO.
GREENLEE BROS. & CO. ★ MATTISON MACHINE WORKS ★ REHNBERG-JACOBSON MFG. CO.
ROCKFORD CLUTCH DIVISION ★ ROCKFORD MACHINE TOOL CO. ★ SUNDSTRAND MACHINE TOOL CO.
Borg-Warner Corporation

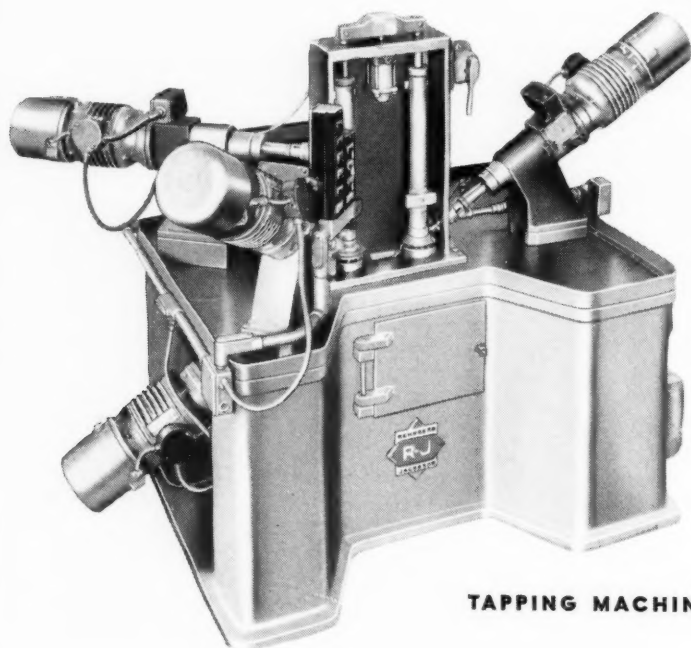
Rehnberg-Jacobson

SPECIAL DRILLING AND TAPPING MACHINES FOR 11 SMALL OPERATIONS ON PAIRED AUTO AXLE TUBES

Each machine has a special air-clamping fixture to hold a pair of Rear Axle Tube Assemblies — one right and one left. The tubes are first placed in the drilling machine and then transferred to the tapping machine. In the drilling machine, an angular hole for $\frac{1}{8}$ " pipe tap is combination drilled and spot-faced in each of the flange ends, a $\frac{7}{64}$ " hole is drilled in the R.H. piece, and two $\frac{7}{64}$ " holes and a hole for $\frac{1}{4}$ "-28 tap are drilled in the L.H. piece. In the tapping machine the $\frac{1}{4}$ "-28 hole is tapped and the two holes for $\frac{1}{8}$ "-27 straight pipe threads are tapped. Drills follow up from below to chamfer where the tap breaks through. The L.H. piece is set at an angle so the tools can clear (one lower drill unit being out of sight in the picture).



DRILLING
MACHINE



TAPPING MACHINE

USE R-J UNITS

All operations are performed by standard Rehnberg Drill Units and Tap Units mounted in simple brackets to present the tools accurately at the proper angles and positions. Each Unit has its own built-in automatic feed cam which controls the complete cycle of each tool in proper synchronism. The result is a highly productive, easily-operated machine having a durable, uncomplicated, and conveniently-serviceable structure.

REHNBERG-JACOBSON MFG. COMPANY

DESIGNERS & BUILDERS OF
SPECIAL MACHINERY



2135 KISHWAUKEE ST.
ROCKFORD, ILLINOIS

MADE IN

ROCKFORD...TESTED ENGINEERING AND CRAFTSMANSHIP
ILLINOIS, U.S.A.



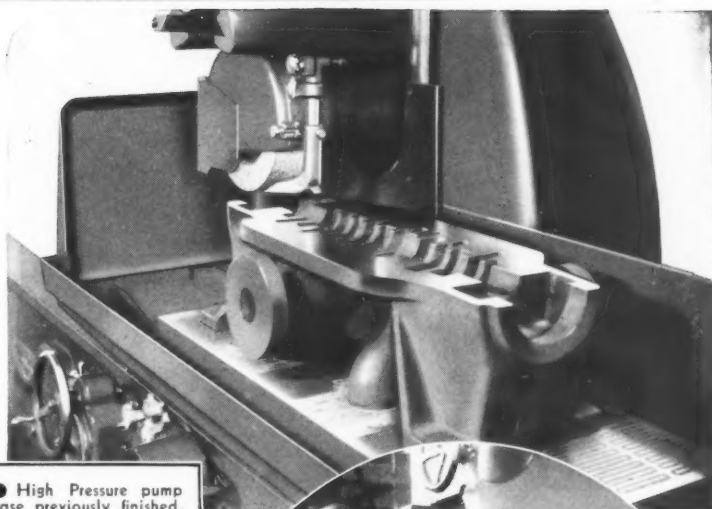
MATTISON GRINDER

Cuts time up to 75%

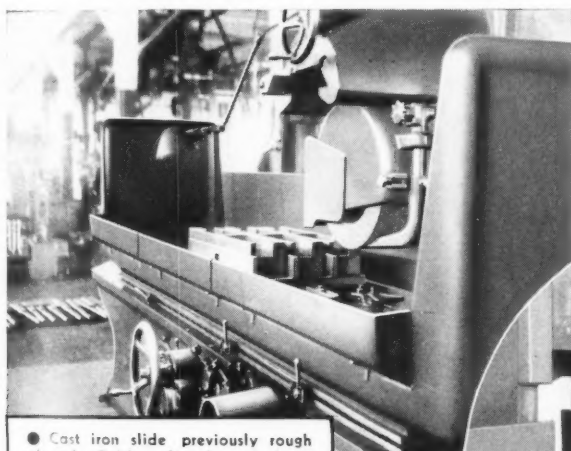
ON JOBS PREVIOUSLY HAND SCRAPED

Examples: Time on pump case reduced from 40 hours to 4 hours Time cut from 12 hours to 3½ hours on slide castings
Yearly saving on Housings — 22% the cost of machine, etc.

When added together, time savings like this make a big difference in manufacturing cost. To see what Mattison High-Powered, Precision Surface Grinders can do on your work, send us blue prints for production estimates.



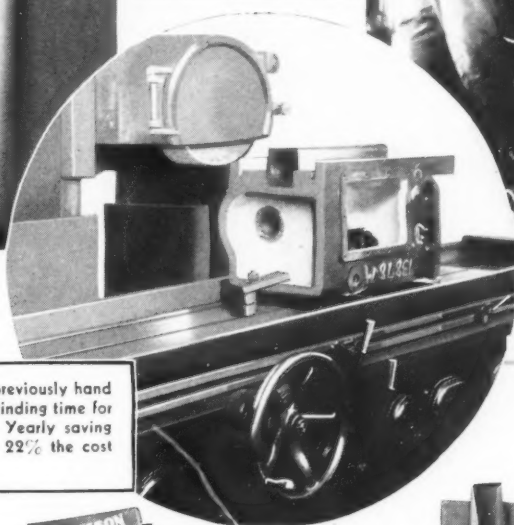
● High Pressure pump case previously finished, planed and hand scraped in from 40 to 48 hours — Now the Mattison Grinder has made these operations unnecessary, reduced time to 4 hours and case comes through with a fine finish and accurate to within .0003".



● Cast iron slide previously rough planed, finish, planed and hand scraped — NOW GROUND on Mattison Grinder (6 pieces per set-up) at an 50% savings in time. Finish planing and scraping operations eliminated.

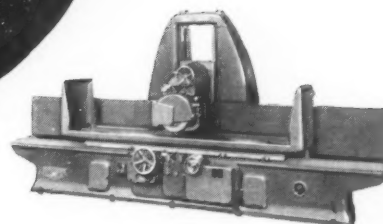


● Cast iron frame previously hand scraped, NOW GROUND top and bottom of casting, shoulder and inside surfaces. 75% time saving.



● Cast iron Housing previously hand scraped in 8 hours. Grinding time for housing is 2.5 hours. Yearly saving on this job alone was 22% the cost of machine.

Write for Free Set-up Book containing further examples, showing how others have reduced time and cut costs with Mattison Grinders.



Mattison High Powered Precision Surface Grinder.
Table Sizes: 12" to 36" wide, 36" to 192" long.

MATTISON

MACHINE WORKS

ROCKFORD • ILLINOIS



FOR RIGID ACCURACY IN MACHINE TOOLS...

MADE IN
ROCKFORD
ILLINOIS, U.S.A.

B-C COMBINATION SHARPENING MACHINE

*Services
Seven Hobbing Machines*



More Facts

on the B-C Combination Sharpening Machine, with actual set-ups on hobs, cutters and reamers, are described in Bulletin 1486. Ask for a copy today!

SHARPENS
10 TO 15 HOBBS PER
8 HOUR DAY
RANGING FROM 2 TO 10 PITCH

This Barber-Colman Combination Sharpening Machine in the plant of a large machine tool builder, is sharpening 10 to 15 large size hobs per 8 hour day, ranging from 2 to 10 pitch. Resharpended hobs from this one machine service a total of 7 production hobbing machines. The machine is also used for re-conditioning all milling cutters and reamers, consistently maintaining original tool accuracy.

In operation for three years, the machine has had no downtime, and has shown less than the usual amount of wear. Controlled sharpening as performed on this B-C Sharpening Machine, returns hobs, cutters and reamers to their original tool accuracy, and results in increased tool life with consequent lower tool cost per finished piece.

SAVE IN MAN-HOURS, MACHINE HOURS,
SHARPENING COSTS AND TOOL COSTS

A large variety of cutting tools are easily, economically and precisely sharpened on this extremely versatile machine. Positive mechanical control of sharpening operations brings greater tool efficiency, with finer precision and higher production.

Constant duplication of original tool accuracy is assured through the positive mechanical control of all important sharpening factors, such as helix angle, indexing and feed control. Hobs, cutters and reamers are sharpened to better-than-average accuracy, thus increasing their life, and lowering the tool cost of the finished piece.

Have a B-C Hobbing Engineer show you how you can get lower tool costs and more life out of cutting tools by proper sharpening on the B-C Combination Sharpening Machine.



HOBGING MACHINES,
HOBBS, HOB SHARPENING
MACHINES, REAMERS,
REAMER SHARPENING
MACHINES, MILLING CUT-
TERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

GENERAL OFFICES AND PLANT • 109 LOOMIS ST. • ROCKFORD, ILL., U.S.A.



MADE IN
ROCKFORD...FOR MACHINES DESIGNED TO SUIT YOUR PRODUCTION
ILLINOIS, U.S.A.

Machinery, March, 1946



BARNES HYDRAULIC UNITS ACTUATE MODERN FLASH WELDER

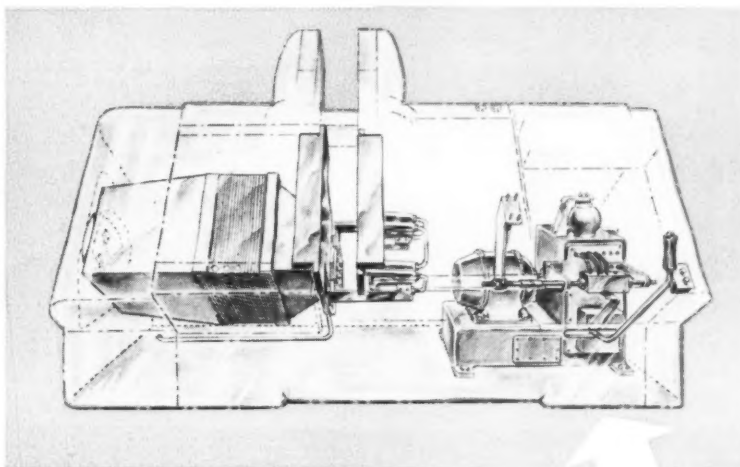
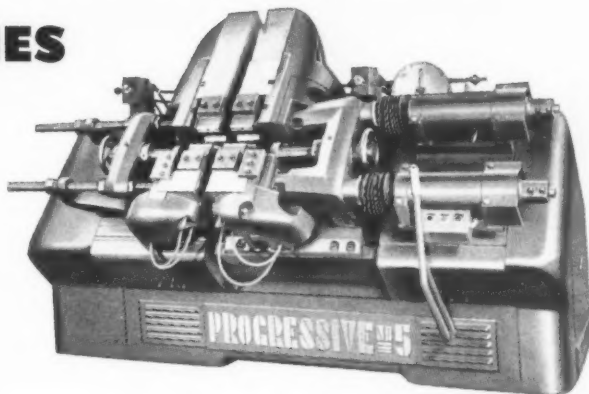
PROGRESSIVE MACHINES USE "L-TYPE" UNITS

The line of high-production standardized Flash Welders made by the Progressive Welder Company of Detroit presents a new conception of combined utility and convenience of operation heretofore not associated with welding equipment. A Barnes Hydraulic Unit mounted inside the frame actuates the clamping and upset mechanisms by means of simple, convenient, flexible controls.

Have you investigated the possibilities of hydraulics for your new applications? It may be that we can help you, too, to solve your power problems. If you will submit details, Barnes engineers will give your inquiry prompt attention.

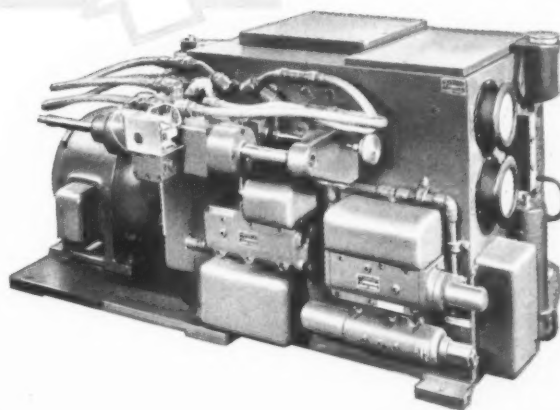
BARNES SUPPLIES COMPLETE HYDRAULIC UNIT

The L-Type Unit as shipped to the welder manufacturer is a complete assembly, fully piped and thoroughly tested at the factory. It is specially equipped to meet the needs of this application.



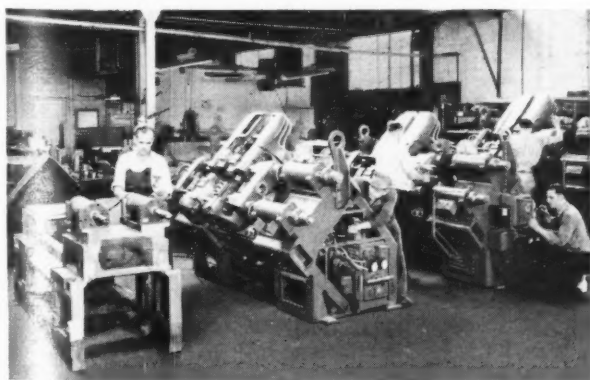
MECHANISM IS FULLY ENCLOSED

The Hydraulic unit is set into a compartment in the machine base, where it is fully protected from dirt and flash. Pressure gauges, sight gauge, relief valves and adjustments are all located at the end for easy access.



UNIT FITS COMPACTLY IN BASE

The Barnes Hydraulic Unit, as shown in this picture on the assembly floor, is simply set into its compartment in the machine and the only connections necessary are to the cylinders, electrical service and controls.



John S. Barnes Corporation

DETROIT OFFICE: 503 New Center Bldg.

325 South Water Street
ROCKFORD, ILLINOIS

NEWARK OFFICE: 660 Industrial Office Bldg.



MADE IN

CENTER OF MACHINE TOOL EXCELLENCE... **ROCKFORD**

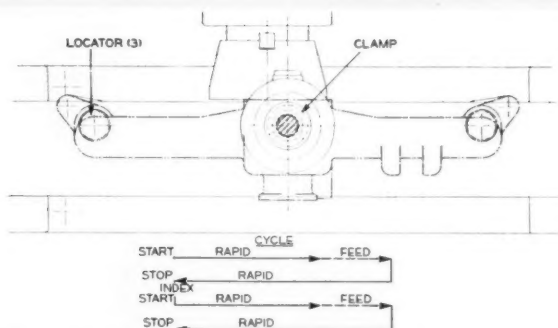
Machinery, March, 1946

How SUNDSTRAND Engineered Production WILL IMPROVE YOUR MILLING METHODS

Here are three different manifold milling jobs. Although they have different production and tooling requirements, each problem has been solved with a minimum of equipment. That's Sundstrand *Engineered* production . . . a method of solving production milling problems with: (1) standard machines, or: (2) standard machines with special heads and fixtures to suit the job, or: (3) entirely special machines which warrant their application due to production requirements and the inability of standard equipment to solve the problem economically.

The following is a brief outline of our complete engineering and manufacturing service to meet any of your production milling requirements in small and medium size work. One of these methods may be the solution to your present problem.

One of These 3 Methods Will be Most Economical for Your Production Milling Job . . .



STANDARD RIGIDMILS WITH FIXTURES AND TOOLING TO SUIT YOUR WORK . . .

Here's a relatively low production job solved with a *standard* Sundstrand Rigidmil. Accuracy requirements dictated that the opposed surfaces be milled with only one handling

of the part. A simple clamping fixture mounted on a standard manually indexed base makes it unnecessary to unclamp and reclamp part between cuts.



RIGIDMILS

FLUID-SCREW RIGIDMILS

AUTOMATIC LATHES

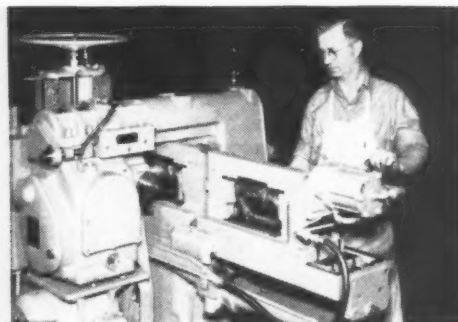
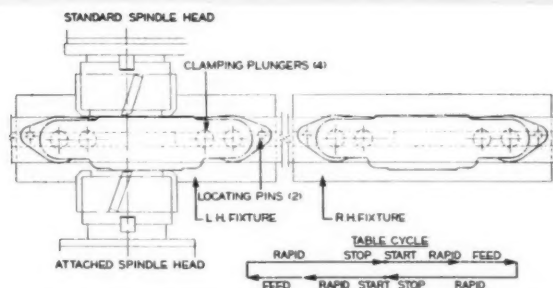
HYDRAULIC EQUIPMENT

MADE IN

ROCKFORD...FOR ACCURATE, FAST METAL REMOVAL

ILLINOIS, U.S.A.

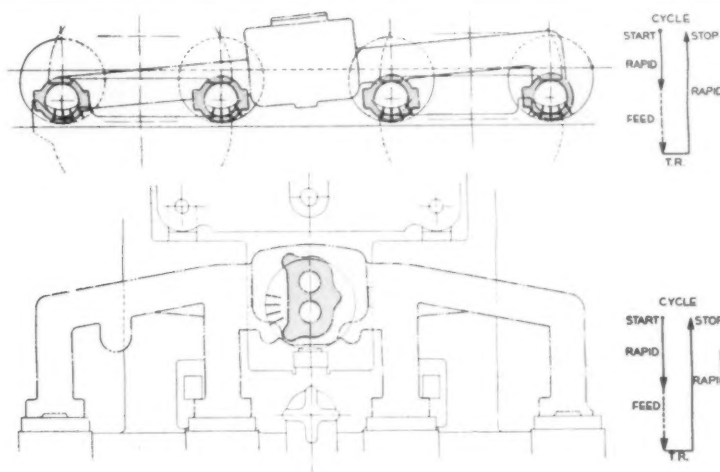
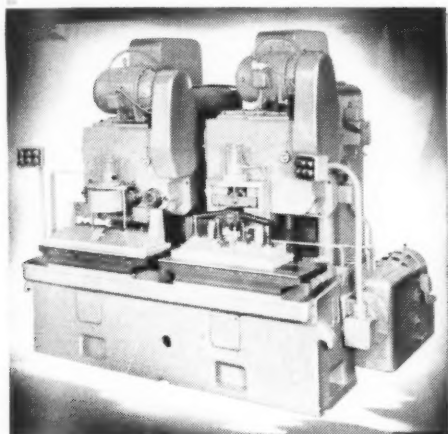




RIGIDMILS WITH SPECIAL HEADS AND TOOLING . . .

Here's a different solution to a similar problem requiring higher production. A standard Rigidmil is provided with an outboard head so that both faces can be machined simultaneously. Two fix-

tures are used, one at each end of the table. One part is machined while the opposite fixture is being unloaded and loaded.



ENTIRELY SPECIAL MACHINES . . .

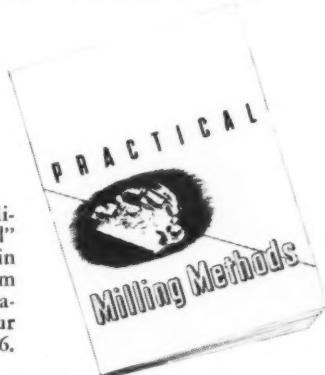
Still higher production requirements resulted in this machine, a Sundstrand Special Twinplex Rigidmil. Four spindle head on L. H. column mills 4 ports. Single spindle head on R. H. column mills carburetor pad. Operator loads at one sta-

tion while part is being machined at other station. Hydraulic clamping speeds up loading. Fixture automatically retracted on return stroke of head so that cutters do not drag over finish milled surface. Automatic chip conveyor removes chips to end of machine.

MORE PROOF

Free

More proof of the successful application of Sundstrand "engineered" milling production is contained in this new book. Over 60 problem solutions complete with tooling diagrams are included. Write for your copy today. Ask for Bulletin No. 646.



**SUNDSTRAND
MACHINE TOOL COMPANY**

2530 Eleventh St. • Rockford, Ill., U.S.A.

DRILLING AND CENTERING MACHINES

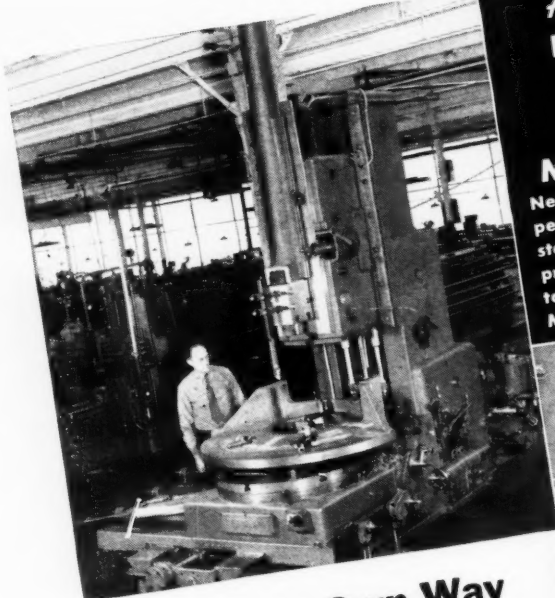
SPECIAL MILLING AND TURNING MACHINES



YOU'LL FIND YOUR PRODUCTION MACHINE TOOLS IN...

**MADE IN
ROCKFORD
ILLINOIS, U.S.A.**

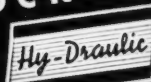
Hy-Draulic



Pays Its Own Way In A Hurry

Certain types of machining operations are "slotter jobs." Cumbersome or difficult for other machine tools, such work can be handled most easily and quickly on a Rockford Hy-Draulic Slotter. Extensive experience in a variety of shops has proved that Rockford Hy-Draulic Slotters are practical machine tools that pay for themselves in a hurry. Illustrated is a typical use; there are many, many others. Check your own machining operations for time-saving production-increasing slotter jobs. Meanwhile write today, for Hy-Draulic Slotter Bulletin 1531.

Another ROCKFORD



MACHINE TOOL

New machines with capacities and performance to meet present-day standards are essential to operating profits. Let us show you the advantages of modern Rockford Hy-Draulic Machine Tools.



Rockford Hy-Draulic SLOTTERS

Hy-Draulic Slotters are made in three sizes with maximum stroke lengths of 12", 20", and 36".



4521

ROCKFORD MACHINE TOOL CO., ROCKFORD, ILLINOIS



SHAPERS



PLANERS



SLOTTERS



SHAPER-PLANERS

MADE IN

ROCKFORD...MACHINE TOOL SHOPPING CENTER

ILLINOIS, U.S.A.

Machinery, March, 1946



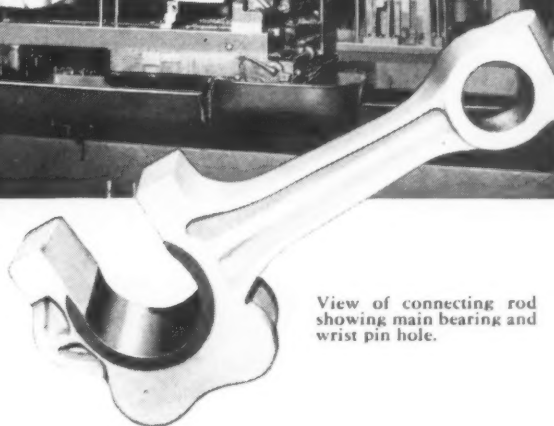
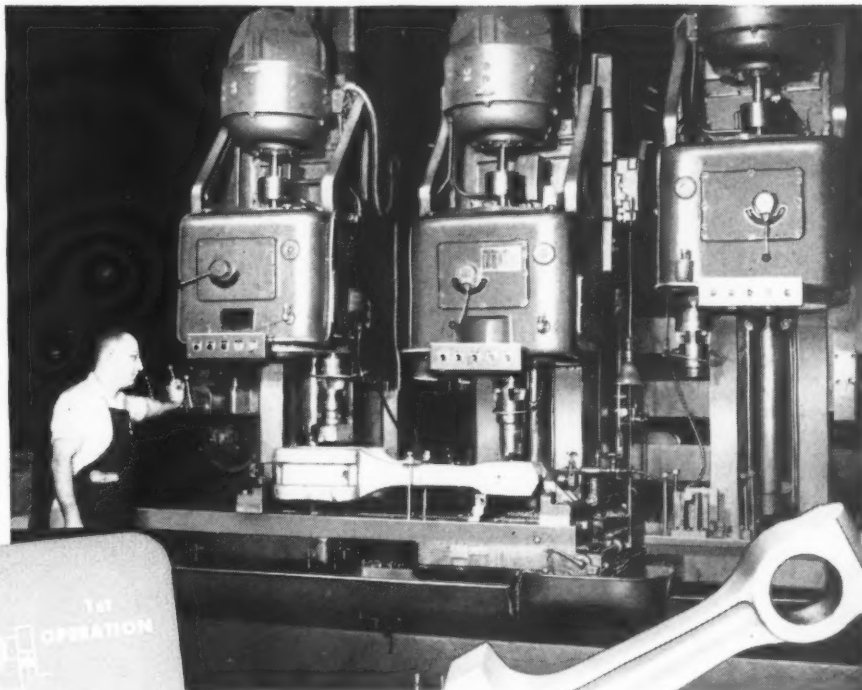
ROCKFORD

9 Minutes TO BORE AND FACE MAIN BEARING and WRIST PIN HOLES

Special Three-Column Boring Machine provided with semi-automatic cycle of rapid traverse, feed, fast feed, slow feed, traverse return and stop. Manual shift for quick gear change, variable speed motors and pick off gears give wide range of spindle speeds. Reverse feed is provided for back boring and facing. Machine has 30" feed stroke and the distance from the fixture platen to spindle nose is 8" min.-38" max.

At this diesel engine manufacturing plant, the main bearing and wrist pin holes in large diesel engine connecting rods are *bored* and *faced* on a W. F. and John Barnes Special Three-Column Vertical Boring Machine. The connecting rods are designed so that the wrist pin end has no cap to bore. Center distances of the rods vary from 21" to 48".

In nine minutes, a wrist pin hole, 5.994" diameter, and main bearing, 10.0625" are rough bored; and in a second operation, faced and chamfered 5/16" x 45°, with cap in place.



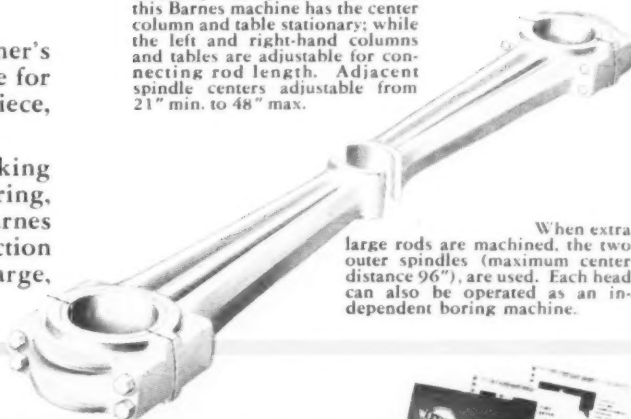
View of connecting rod showing main bearing and wrist pin hole.

Increase Production and Simplify Difficult Machining Operations

W. F. and John Barnes, in conjunction with the customer's design engineers, designed and built this special machine for performing specific operations on a particular workpiece, which varies in size and diameter.

Barnes complete machine design service for metal working operations, which includes drilling, reaming, tapping, boring, facing or milling, is available, without obligation. Barnes offer practical and economical solutions for high production or short run machining of varied parts . . . small or large, simple or complex.

Designed to bore two rods simultaneously when placed end to end, this Barnes machine has the center column and table stationary; while the left and right-hand columns and tables are adjustable for connecting rod length. Adjacent spindle centers adjustable from 21" min. to 48" max.



When extra large rods are machined, the two outer spindles (maximum center distance 96"), are used. Each head can also be operated as an independent boring machine.

For Production Men



Send for your copy of "SPECIAL MACHINE TOOLS" Book, No. 346, which shows many interesting metal working jobs, including operations and tooling. This loose-leaf book will be sent, without cost, to key production men when requested on company letterhead.



W. F. and JOHN BARNES

320 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.



ROCKFORD MADE MEANS PRECISION MADE...

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ILLINOIS, U.S.A.

*Specify
For*

ROCKFORD PULLMORE MULTIPLE-DISC CLUTCHES

COMPACT DESIGN

HIGH TORQUE *

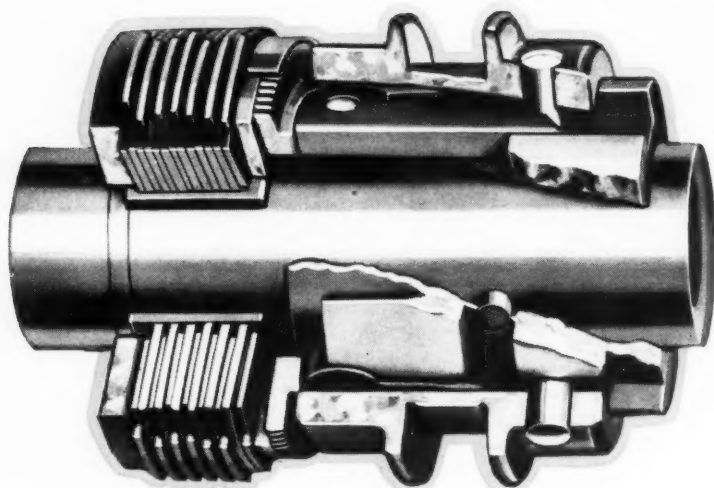
HIGH-RATIO LEVERS

POSITIVE NEUTRAL

PRECISION BUILT

LONG WEAR LIFE

EASY ADJUSTMENT



*PULLMORE discs provide high torque capacity, and efficient lever design enables light engaging pressure. Discs are made from special clutch-disc materials, accurately ground and tested for flatness. Made in single and double types, for operation in oil or dry, ROCKFORD Pullmore Multiple-Disc CLUTCHES have capacities from 1 to 90 H.P. at 500 R.P.M. They handle loads of much greater than rated capacity, when operated at higher speeds. Can be used both to drive and as a brake. Let our engineers show you how easily these powerful, compact clutches will fit into your product designs.

SEND FOR THIS HANDY BULLETIN ON POWER TRANSMISSION CONTROL



It shows how the construction advantages of PULLMORE Multiple-Disc CLUTCHES have been utilized to solve clutch problems in machine tools, hoists, truck lifts, packaging machines, spring coilers, etc. Gives complete capacity and dimension data. Contains helpful application diagrams. Every design engineer will want this bulletin.



ROCKFORD CLUTCH DIVISION BORG-WARNER

▲ 410 Catherine Street, Rockford, Illinois, U. S. A. ▲

Pullmore Clutches are sold by Morse Chain Co., offices in principal cities



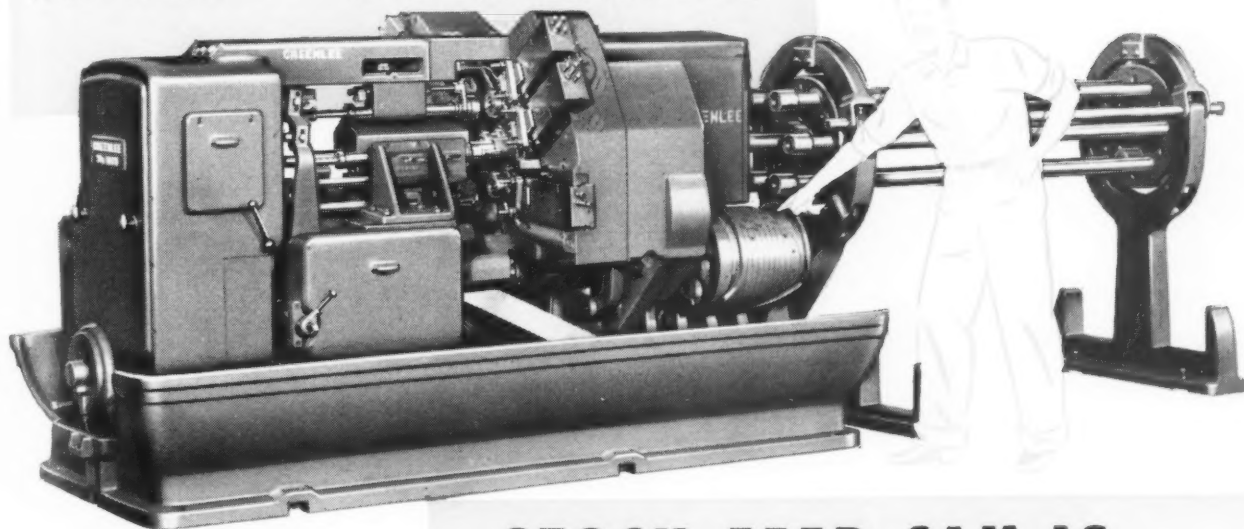
MADE IN

ROCKFORD...CITY OF MACHINE TOOL SPECIALISTS

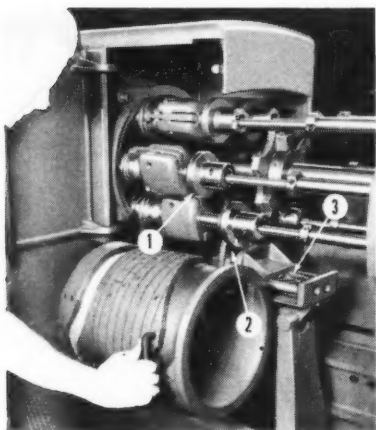
ILLINOIS, U.S.A.



A CONVENIENCE FEATURE OF THE
GREENLEE "6"
 AUTOMATIC SCREW MACHINE



**STOCK-FEED CAM IS
 EASILY AND QUICKLY
 CHANGED FOR NEW FEED**



A close-up of the stock-feed cam, feed-tube collars, collet-operating heads, and the shoes which move the stock-feed tubes. This shows the standard cam strips and how they are attached to the cam barrel.

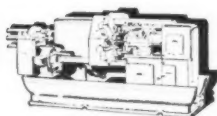
STANDARD CAM STRIPS. Stock feed on the GREENLEE "6" is actuated by a barrel cam located at the rear corner of the machine. Strips 1" wide with diagonal matching ends are attached with socket-head screws to the surface of the barrel. The matching ends produce a continuous cam which, through a roller, actuates the stock-feed shoe. The shoe (2) engages the feed tube collars (1) on the stock-feed tubes.

CONVENIENT TO CHANGE. It is a simple matter to set up this cam for the desired amount of feed. Strips are simply added or removed to make up the nearest full inch above the actual amount of stock to be fed. With the full set of strips in place, the maximum feed of 8" is obtained. A separate fixed cam channel is provided for the roller which actuates the collet-operating mechanism, and this is located

so as to synchronize properly the collet and stock feed actions.

SAFETY FEATURES. Springs (3) behind the stock-feed shoe (2) permit this shoe to yield if the stock is obstructed, preventing damage if a short piece of stock is left in the collet. The hardened feed tube collars (1) are mounted on ball bearings and do not rotate when the stock feeds.

OTHER FEATURES OF THE MACHINE. The GREENLEE "6" has many outstanding features such as quick setting of the main tool slide feed stroke, rapid change of standardized cross-slide cams, accurate and easy tool-setting, convenient feed and spindle speed setting, easy-to-get-at tooling area, identical tool cavities, and others which contribute to efficient, accurate work and quick change-over. For these reasons the GREENLEE "6" is often called "The Operator's Favorite".



GREENLEE BROS. & CO.
 1863 MASON AVE., ROCKFORD, ILLINOIS

WRITE TODAY FOR MORE FACTS

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES



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BROACHING

is One Business Where You Need

"PULL"

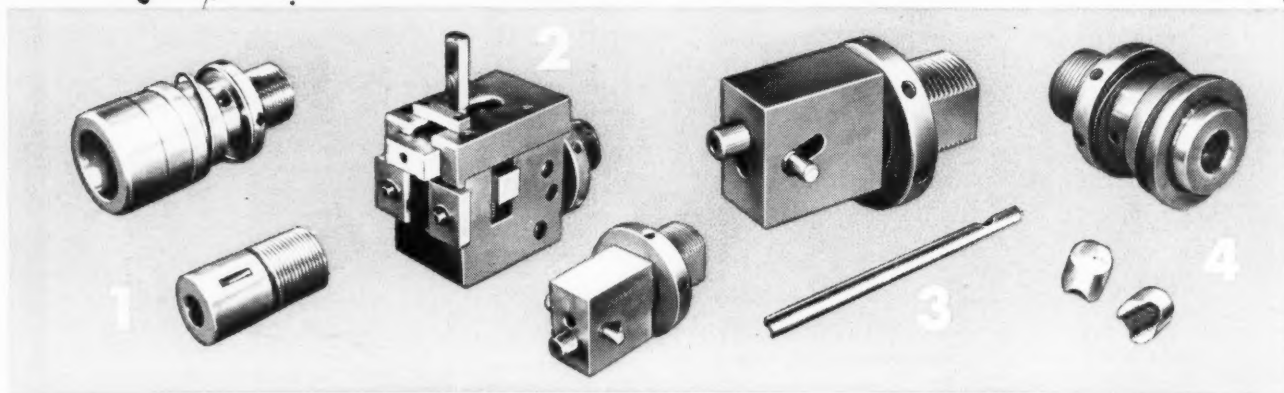
Be Sure You Have The Right

American Broach Pull Head



TO GIVE your broaches and broaching machines a maximum degree of operating time, you need quick-connecting broach pull heads. *American* offers a complete line of pull heads—the *right* head for every broaching operation. Each *American* model is designed with a particular purpose in mind. All are engineered and built by broaching experts.

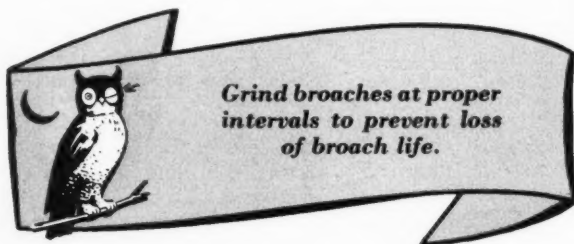
To help you get the most from your broaching equipment, *American* has published an illustrated booklet on broach pull heads and their uses. Write for free copy. It is part of *American's* complete broaching service—machines, tools, and engineering.



Four types of *American* Broach Pull Heads are illustrated. (1) Automatic 4-Jaw Type Puller for horizontal or pull up use. A similar model, with chip shield, is made for pull down use. Standard sizes for shanks from $\frac{1}{4}$ " to $3\frac{1}{2}$ " diameter. (2) Automatic Keyway Broach Pull Head for use with keyway square, rectangular, and oval broaches. Broach is rigidly held in proper alignment. Set of adapters permits using old style threaded keyway broaches with this head. (3) Automatic Pin Type Puller for use with broaches having shanks $\frac{1}{2}$ " in diameter or smaller. Holds shank by means of a half-round groove cut across the pulling end. Automatically provides positive radial positioning. (4) Type "V" Quick-Change Broach Puller for use with broaches having old style threaded shank. The two-piece jaws are quickly and easily removed while head is in ma-

chine. Eliminates necessity of screwing broach into place. Replaceable jaws furnished for all sizes of threads up to 1" diameter.

Slotted type broach pullers and ordinary threaded broach pullers, not illustrated, are also available.



MEMBER
BROACHING TOOL
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American
**BROACH AND
MACHINE CO.**

ANN ARBOR, MICHIGAN

**BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY**

DIVISION OF
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ROCKFORD...MACHINE TOOL PLANTS CLOSE TO YOUR PLANT

ILLINOIS, U.S.A.

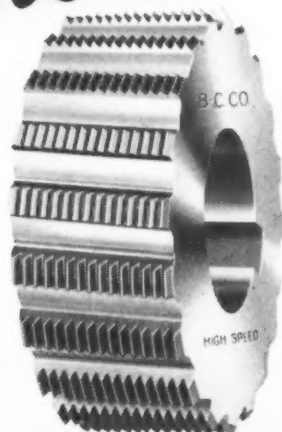


Machine World 1946

12 Shafts per Hour

THREAD MILLED to CLASS III LIMITS

**B-C UNGROUND THREAD MILLING
CUTTERS SHARPENED EVERY 100 PIECES**



Class III limits are consistently maintained when thread milling Final Drive Input Shafts with Barber-Colman Spiral *Unground* Thread Milling Cutters. Threads are 12 pitch, 1 3/4" dia. x 1" long. The shafts are NE-9445 steel, heat-treated before milling to hardness of 33-37 Rockwell C.

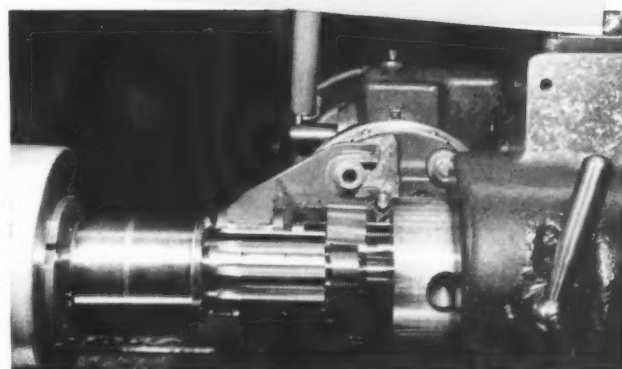
Production is 12 shafts per hour. Speed of cutter, is 105 surface feet; and feed is 3.28" per minute. Cutters are sharpened every 100 pieces.

B-C CUTTERS SPEED PRODUCTION, HOLD ACCURACY, CUT COSTS

This job is another example where B-C Spiral Unground Thread Milling Cutters, especially designed for the job, quickly and economically produced accurate threads.

Higher feeds and speeds were possible with B-C Thread Mills, making them particularly suitable for quantity production of parts where accuracy and finish are essential. Spiral gashes promote a shearing action in the cut to produce a smooth, even surface, reducing chatter and vibration to a minimum. Results are better finish, with increased cutter life.

Barber-Colman Thread Milling Cutters are designed specially for specific jobs. Our Cutter Engineers are available to help with your particular thread milling problems. This Service is available without cost or obligation.



Ask... for "Facts About Thread Milling Cutters"—a factual book with valuable information covering many different thread milling applications. This book will be sent without charge, when requested on company letterhead.

HOBGING MACHINES,
HOB, HOB SHARPENING
MACHINES, REAMERS,
REAMER SHARPENING
MACHINES, MILLING CUT-
TERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

GENERAL OFFICES AND PLANT • 109 LOOMIS ST. • ROCKFORD, ILL., U.S.A.



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FOR METAL REMOVAL WITH ACCURACY AND SPEED... **ROCKFORD**

ILLINOIS, U.S.A.

Machinery, March, 1946



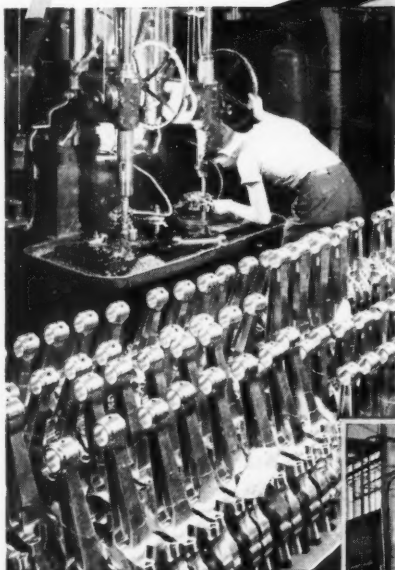
How to

Increase PRODUCTION DRILLING and Reduce OPERATING COSTS



Installation view of **BARNESDRILL** 3-Unit Machine. Vertical Unit has 12-spindle auxiliary head; two opposed horizontal Units have 8-spindle auxiliary heads

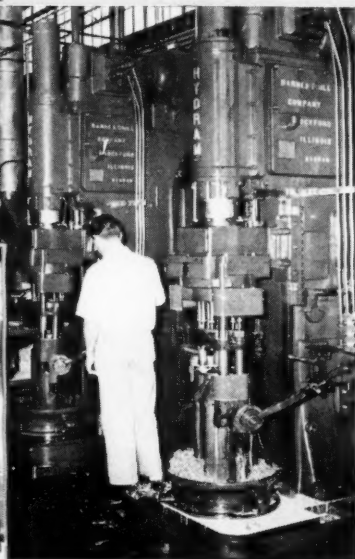
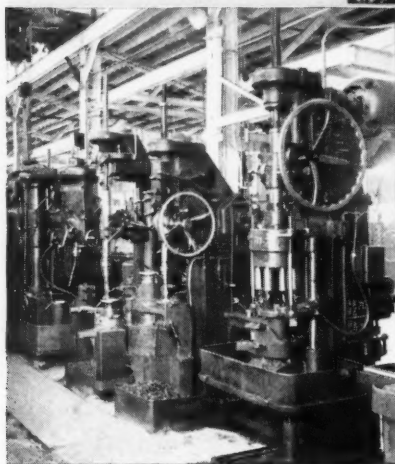
BARNESDRILL
DRILLING MACHINES
PERFORM FASTER and
MORE EFFICIENTLY



Installation of **BARNESDRILL** 2-Spindle No. 262 Gang Drill, drilling and reaming weight hole in split master rod.

Installation of two **BARNESDRILL** H-3 Hydrams with 12-spindle auxiliary heads and indexing fixtures for drilling 24 holes in flange of propeller shaft.

Installation view of Battery of **BARNESDRILL** All-Geared Drilling Machines, showing both single-spindle and multi-spindle setups.



For work above the sensitive drilling class, the complete line of **BARNESDRILL** Drilling Machines adapt themselves readily and quickly to low, medium and high production DRILLING, BORING, REAMING, FACING and TAPPING operations.

Designed for light and medium, heavy-duty and progressive drilling, **BARNESDRILL** Self-Oiling, All-Geared Production Drilling and Tapping Machines provide sturdiness, ample power and a wide range of QUICK change high speeds and feeds.

BARNESDRILL ENGINEERED PRODUCTION UNITS increase production and reduce costs.

THERE IS A **BARNESDRILL** MACHINE WHICH BEST MEETS YOUR DRILLING NEEDS

For *light* and *medium* drilling, **BARNESDRILL** Single and Ganged, Self-Oiling, All-Geared Drilling Machines have capacities of 1" to 2" in steel.

For *heavy-duty* work, **BARNESDRILL** Hydram Machines, with single-spindle, ganged, and multi-spindle arrangements, will handle up to 4" in solid steel.

For *progressive* work—drilling, reaming and tapping operations in sequence—**BARNESDRILL** All-Geared Hydram and Hydraulic Production Units (arranged in horizontal, vertical or angular position to suit individual jobs) have capacities of 1/2" to 4" in steel.

You can choose the proper **BARNESDRILL** machine, with either single or multi-spindle heads, for any class of work from light to heaviest drilling.

Consult **BARNESDRILL** engineers on your drilling problems. Their recommendations will assist you in selecting the **BARNESDRILL** production drilling machine that will give you increased production at lower costs.

Send for your FREE copy of Condensed Catalog M, covering the complete line of **BARNESDRILL** Drilling Machines.



TODAY...

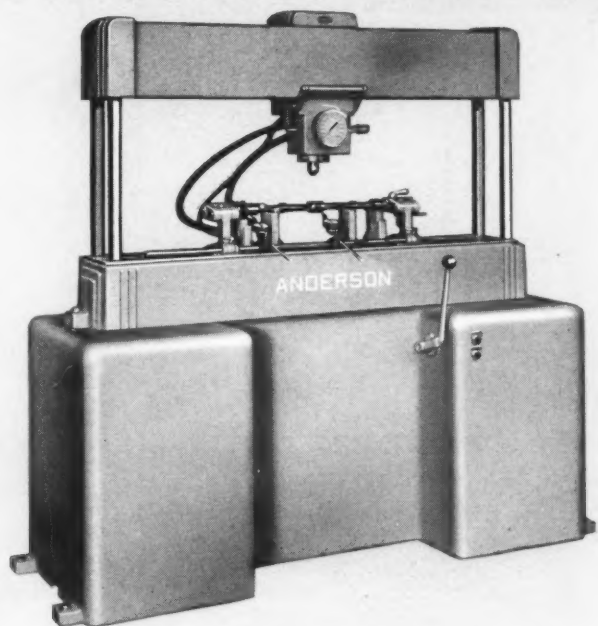
Barnes Drill Co. 814 CHESTNUT STREET ROCKFORD ILLINOIS, U.S.A.

MADE IN
ROCKFORD...A CONVENIENT SOURCE FOR PRODUCTION NEEDS
ILLINOIS, U.S.A.



★ Ohio Reporting

On Anderson Straightening Press Operations



Model HP-0167-P with Traveling Ram

Anderson Hydraulic Power Presses are built with either stationary or traveling rams. They are sensitive, highly accurate machines yet easy to operate. Capacities 10, 25 and 50 tons.

Pressure gauge indicates ram loading . . . adjustable dial indicator shows amount of shaft run-out in pre-loaded, fully loaded and unloaded positions.

Flexible, sensitive control by rotary control valve operated by hand lever. An infinite range of loading up to capacity as lever is moved from 0 to maximum displacement. Push button control of hydraulic unit. Work table, 60" to 108" long. Available attachments include checking rolls, spring loaded centers, adjustable anvils and indicator. To increase production speed, an adjustable stop collar limits the stroke of the ram.

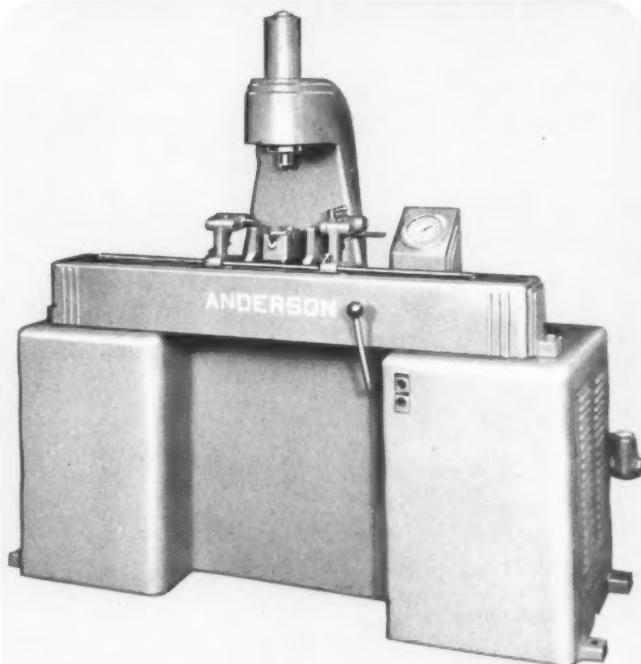
Anderson Hydraulic Hand Presses are also available in 10, 25 and 50 ton capacities. Write for complete information on this time-saving equipment.

The following experiences have been reported by three prominent Ohio Manufacturers . . . (names upon request.)

★ **CLEVELAND** Straightening 30 pieces per hour with former equipment. With Anderson Hydraulic Press, 120 per hour. Production increased 400%.

★ **DAYTON** Formerly straightened 500 pieces per day. Now, with Anderson Press, 1500 per day. Production increase 300%.

★ **HAMILTON** Formerly had a tolerance on drawings of plus or minus .002". After installing Anderson Press drawings changed to plus or minus 1/2 thousandth.



Model HP-010-P with Stationary Ram

ANDERSON BROS. MFG. CO.

Anderson
ROCKFORD, ILL. U.S.A.

Send for these Bulletins

No. 3-6-H on Hand Presses

No. 3-6-P on Power Presses



MADE IN
ROCKFORD
ILLINOIS U.S.A.

FOR PRODUCTION MACHINE TOOLS IT'S...

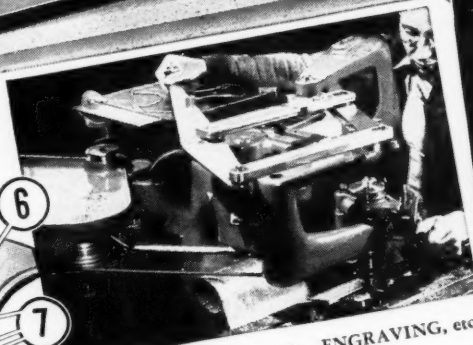
GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING



MATERIAL—4" x 4" square, $\frac{3}{16}$ " Engravers' Brass, as it comes to Gorton Pantograph, with three holes drilled, countersunk.



PROFILING...SLOTING...ENGRAVING, etc. with Unskilled Operator

Seven Operations on ONE Machine...from 1 Master

Showing **VERSATILITY** of GORTON PANTOGRAPH Tracer-Control . . .

ONE GORTON 3-Z PANTOGRAPH now performs work of several machines, eliminating various tools and fixtures formerly required—saving time and expense of separate machine set-ups and tooling.

SIMPLY BY CHANGING CUTTERS AND TRACING on both sides of a single, Flat Template (Master)—both top and bottom of this intricate part are completed within specified tolerances of $\pm .0025$ "—a total of 7 operations, in $\frac{1}{2}$ previous time.

ENGINEERING SERVICE . . . FREE

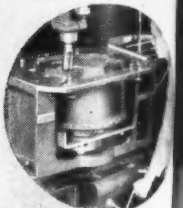
Find out how Gorton Tracer-Control Machines can pay for themselves in time and man-power savings like this in your shop...how they can perform multiple operations, freeing other machines for new work and increase production.

JOB IN BRIEF

PART—Indicator Plate.
7 OPERATIONS—(1) **ROUGH MILL** three arc sections... (2) **FINISH-MILL** sections... (3) **MILL** semi-circular groove and two $\frac{5}{32}$ " counter-bores... (4) **ENGRAVE** Part Number... (5) **Reverse Master** and Part, PROFILE three U-shaped grooves along arc edges... (6) **ENGRAVE** word "SPREAD" and (7) **ENGRAVE** three Y-SLOTS to penetrate counter-bores.
CUTTERS—(only 4 needed)—Single Flute, straight-shank End Mills.
SPEEDS—Up to 9,200 r.p.m.

SUBMIT ANY PROBLEM—Send a sample part, prints, or specifications to your nearest Gorton dealer, or to the Gorton Factory at Racine, Wis. No obligation.

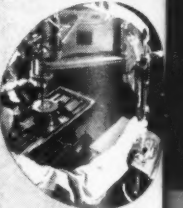
The Right Size
The Right Type
of Machine
for Every Job...
From 2 oz. to 2 ton
DIE BLOCKS



Tracer-Controlled MILLING



Tracer-Controlled DUPLICATING



Tracer-Controlled ENGRAVING



Tracer-Controlled ETCHING

In stock
Ryerson
the two
sizes sh
right. P
are 1 1/4
large p
1" long
Other p
stock in
structur
sheets, A
loys, A
Stainless



GORTON Precision MACHINES



CUTTER GRINDERS



SLOTING MACHINES



3-Z Dimensional PANTOGRAPHS



Vertical & Universal Head Taper-Speed MILLERS



Manual & Electric Control DUPLICATORS



Manual & Electric Control DUPLICATORS



Manual & Electric Control DUPLICATORS



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- ☐ Condensed Catalog
☐ Pantograph Engraving Machine

Name..... Title.....
Company.....
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PREVENT these Accidents!



Get **SAFE, SURE** Footing with **INLAND 4-WAY FLOOR PLATE**

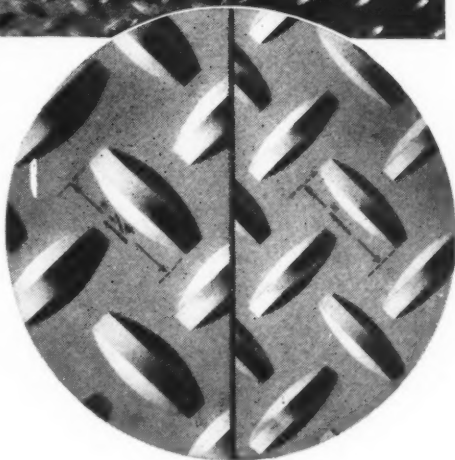
About 150,000 men and women are injured every year by slipping and falling accidents in industry! But you can guard against these accidents in your plant. With Inland 4-Way Floor Plate on floors, stairways, loading platforms, walkways, etc. you get very safe traction and long wear. When you order from nearby Ryerson stocks, plates are delivered quickly, accurately cut and ready for installation.

Wherever sure footing is important, Inland 4-Way Floor Plate should be used. Projections, covering more than one third of the area, center on one another at right angles, giving 4-way protection against slipping—forward, backward, to the left or right. Because Inland floor plate is made of tough rolled steel, it is structurally strong and long wearing.

Ryerson has two pattern sizes and many thicknesses in stock, plus facilities for cutting to square or irregular shape. For quick delivery, contact the plant nearest you. *Inland 4-Way Floor Plate Catalog sent on request.*

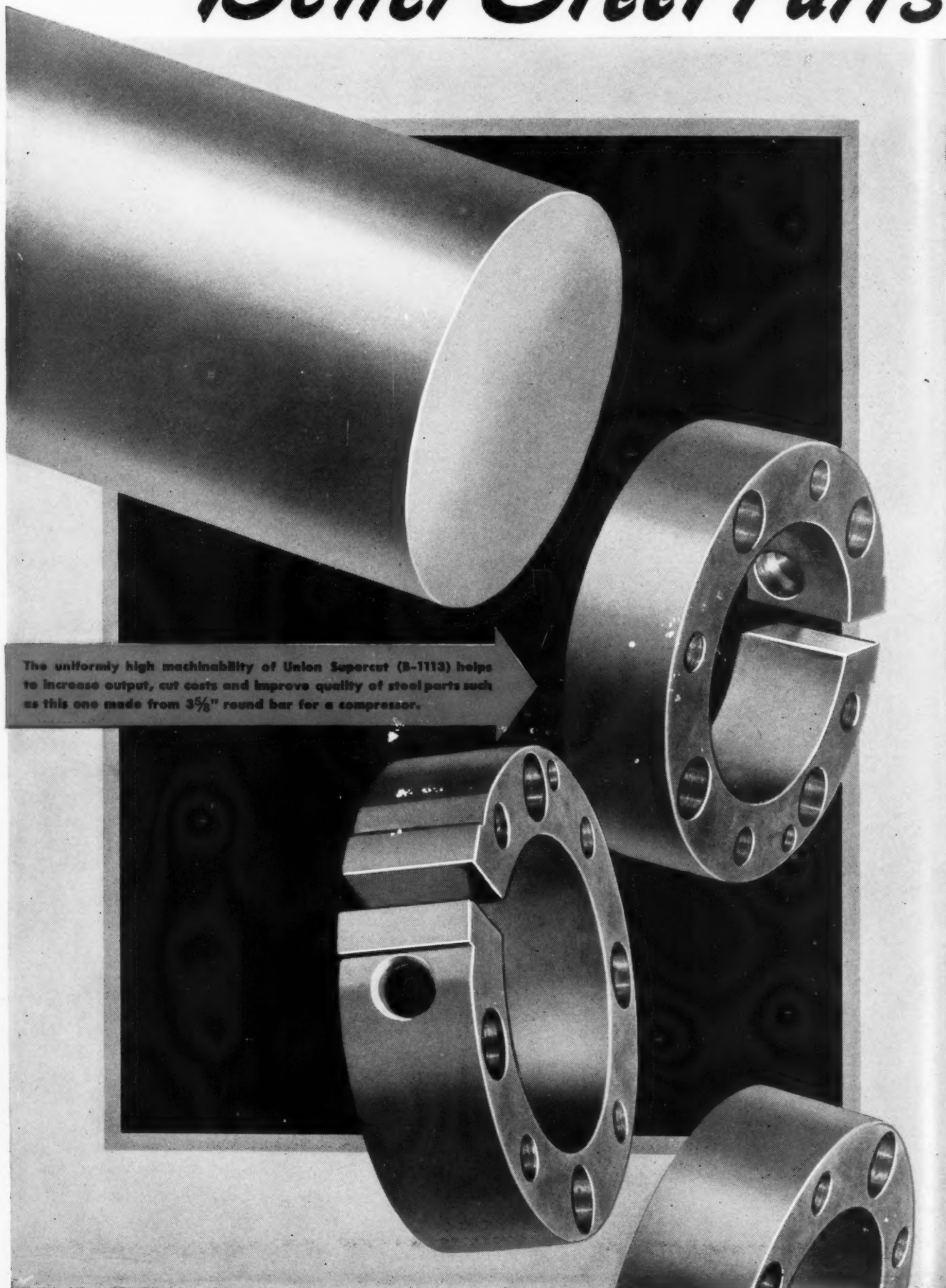
Joseph T. Ryerson & Son, Inc. Steel-Service Plants at: Chicago, Milwaukee, Detroit, St. Louis, Cincinnati, Cleveland, Pittsburgh, Philadelphia, New York, Boston, Buffalo.

In stock at eleven Ryerson plants are the two pattern sizes shown at the right. Projections are $1\frac{1}{4}$ " long on the large pattern and 1" long on the small. Other products in stock include: bars, structurals, plates, sheets, tubing, alloys, Allegheny Stainless, etc.



RYERSON STEEL

Better Steel Parts



The uniformly high machinability of Union Supercut (B-1113) helps to increase output, cut costs and improve quality of steel parts such as this one made from 3 $\frac{5}{8}$ " round bar for a compressor.

...Faster...at Lower Cost

WITH THIS IMPROVED

MACHINABILITY

You can't sidestep the importance of MACHINABILITY. If you produce steel parts from bar stock by forming, milling, drilling, reaming, threading, tapping or similar operations, the machinability of the bars you use will largely determine your rate of output, your costs and your profits.

Right there is your number one reason for using Republic Union Cold Drawn Steel Bars—because in their manufacture, MACHINABILITY is placed above every other quality.

In Union Drawn laboratories, metallurgists constantly search for new ways to increase machinability, to lengthen tool life, to obtain better machined surfaces, to develop uniform response to heat treatment.

At the same time, engineers cut up tons of steel bars on the latest model "automatic" to study machining performance at various feeds and

speeds. And they spend long hours in customers' plants watching steel bars perform under actual operating conditions.

To further improve MACHINABILITY, and to assure uniform hardness and physical properties, capacity has been greatly increased in all Union Drawn plants for furnace treatment—annealing, normalizing, stress-relieving, spheroidizing and other heat treatments.

Today, Republic Union Cold Drawn Steels are rated "tops" by many parts producers. And Republic metallurgists and engineers are ready to help you get the same high performance—better steel parts—faster—and at lower cost.

REPUBLIC STEEL CORPORATION
Union Drawn Steel Division • Massillon, Ohio
GENERAL OFFICES • CLEVELAND 1, OHIO
 Export Department: Chrysler Building, New York 17, N. Y.

Republic

UNION COLD DRAWN

STEELS



Reg. U. S. Pat. Off.

Free-Machining Resistor, Open-Hearth and Electric Furnace Steels

Union Cold Drawn Special Sections

Union Cold Drawn and Ground Rounds; Turned and Polished Rounds; and Turned, Ground and Polished Rounds (Union Precision Shifting.)

Specify one of these

MO-MAX

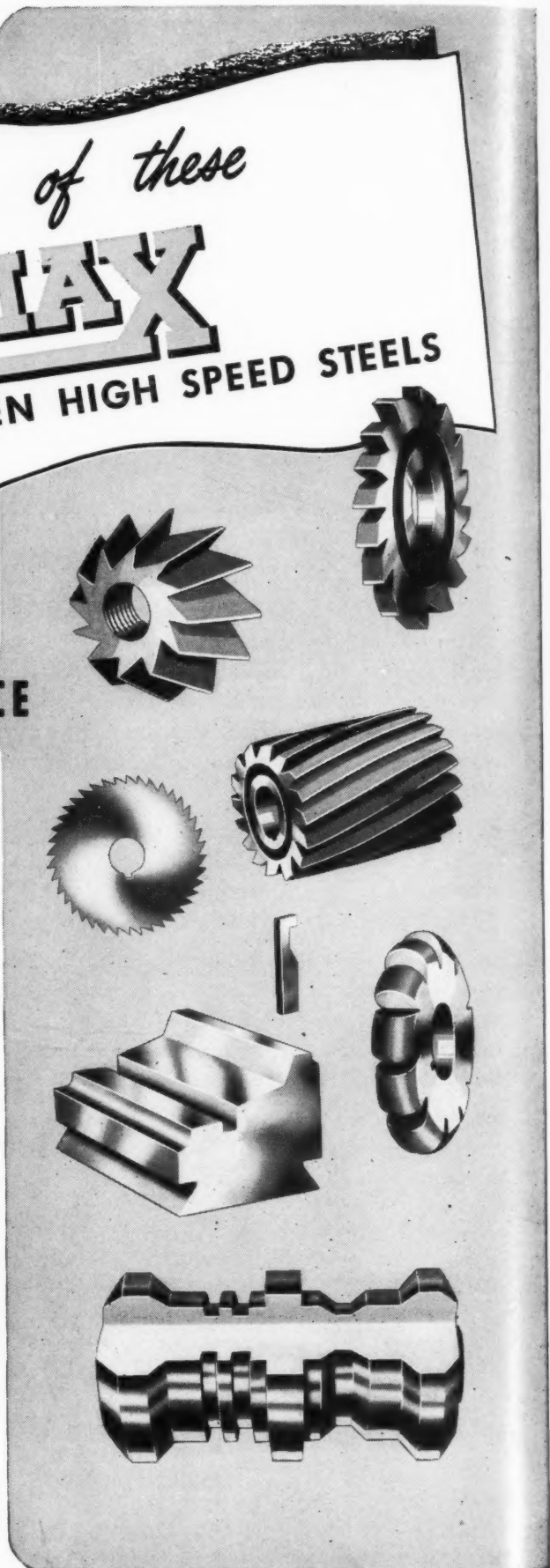
MOLYBDENUM-TUNGSTEN HIGH SPEED STEELS

for

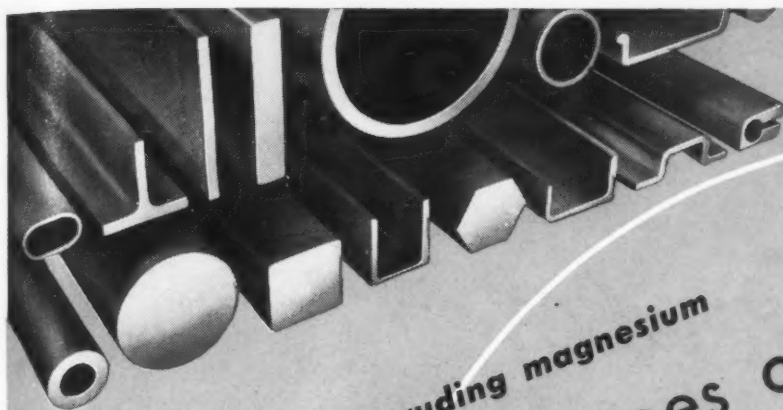
BETTER TOOL PERFORMANCE

"LMW".....	ALLEGHENY LUDLUM STEEL CORP.
"MOHICAN".....	ATLAS STEELS LIMITED
"BETHLEHEM HM"....	BETHLEHEM STEEL COMPANY
"MO-CUT".....	BRAEBURN ALLOY STEEL COMPANY
"STAR MAX".....	CARPENTER STEEL COMPANY
"MOLITE M-1".....	COLUMBIA TOOL STEEL CO.
"REX T-MO".....	CRUCIBLE STEEL CO. OF AMERICA
"DI-MOL".....	HENRY DISSTON & SONS, INC.
"HI-MO".....	FIRTH-STERLING STEEL CO.
"REX T-MO".....	HALCOMB STEEL COMPANY
"MOGUL".....	JESSOP STEEL COMPANY
"TATMO".....	LATROBE ELECTRIC STEEL CO.
	ST. LAWRENCE ALLOYS, INC.
"S. T. M.".....	SIMONDS SAW & STEEL CO.
"MO-TUNG".....	UNIVERSAL-CYCLOPS STEEL CORP.
"8-N-2".....	VANADIUM-ALLOYS STEEL CO.
"VUL-MO".....	VULCAN CRUCIBLE STEEL CO.

For the full story on MO-MAX high speed steels—their physical properties, their advantages, and how to heat treat them—write today to Department E for the new, revised MO-MAX Handbook.

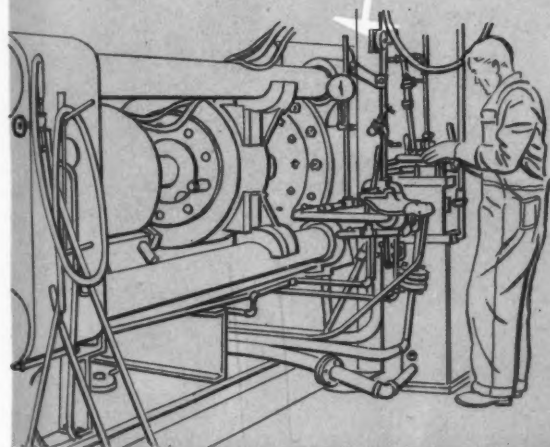


THE CLEVELAND TWIST DRILL CO. • 1250 East 49th Street • Dept. E. • Cleveland 14, Ohio



they're extruding magnesium

—into shapes of lightness



Economical magnesium shapes—with their remarkable combination of lightness and strength—are everyday production items in up-to-date extrusion plants today. They simplify design problems, speed operations on many a job.

You'll find it advantageous to specify extruded rods, bars, tubes, standard and special shapes in magnesium when designing your new products or redesigning your old ones. Intricate shapes not practical to produce by any other method can readily be extruded, often eliminating costly fabrication operations. And the cost of extrusion dies is low enough, too, to make these special shapes economical.

Dow offers a wide variety of extrusions as standard items, and supplies many special shapes to order. Engineering assistance is available to you through the nearest Dow office.

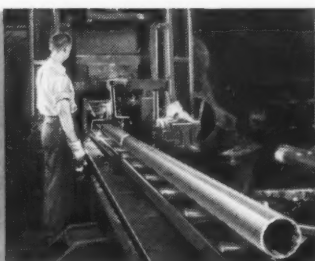
*Ready...
to make products move!*

MAGNESIUM

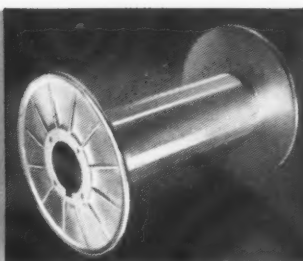
LIGHTEST OF ALL STRUCTURAL METALS



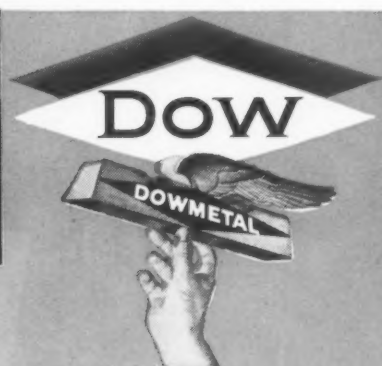
Dow's complete magnesium line includes a variety of alloys specially prepared for extrusion; also extrusions of many kinds.



Thirty years of leadership in the magnesium field enables Dow to offer complete technical aid in all phases of its application.



Extruded magnesium tubing forms the barrel of this lightweight warp beam, used on modern high-speed textile equipment.



MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

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MADISON-KIPP

Aluminum Die Castings

BY THE MILLIONS

The new Kipp Hi-High pressure Aluminum die castings have brought a decided change to founding practice of long standing even for small parts. Red Devil Tools of Irvington, New Jersey, has added value and marketability to their glass cutter by the use of bright, light weight and strong Kipp die cast Aluminum.

Madison-Kipp is both experienced and equipped to handle the really high quantity production jobs.

MADISON-KIPP CORPORATION
203 Waubesa St., Madison 4, Wis., U.S.A.
Sole Agents in England: Wm. Coulthard & Co., Ltd., Carlisle

FOR PERMANENT BEAUTY,

EXCEPTIONAL FORMABILITY AND LOW COST



- nothing equals
Stainless Steel!
IN PARTS LIKE THESE

STAINLESS STEEL has more than lasting good looks and eye-appeal to recommend it.

The fact that stainless steel is exceptionally ductile and can be readily fabricated into shapes ordinarily difficult to form, is an important advantage that should not be overlooked. But it is only one reason why stainless steel parts can be turned out at surprisingly low cost as well.

Stainless steel's practical immu-

nity to rust, tarnish and corrosion—plus its superior strength—makes it possible to materially *reduce the thickness* of parts in which it is used without weakening them and without inviting premature rust-out and failure.

These thinner, lighter parts of bright and lustrous stainless steel require so many *less steps in finishing*, that to the savings in material are added savings in production time which quite frequently bring the cost

of using stainless steel not merely level with but actually below that of less effective materials. Properly used, stainless steel does *not* add to the cost—it only looks as though it did.

We can supply U·S·S Stainless Steel—a perfected and time-tested product—in many analyses and in the most *complete* range of forms, sizes, and surface finishes anywhere obtainable. Our Stainless Steel specialists will gladly go into the economics of its application with you, and help you select the right grade and finish that will do the best job for you.

EVERY SUNDAY EVENING, United States Steel presents *The Theatre Guild on the Air*. American Broadcasting Company coast-to-coast network. Consult your newspaper for time and station.

U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

AMERICAN STEEL & WIRE COMPANY, *Cleveland, Chicago and New York*

CARNEGIE-ILLINOIS STEEL CORPORATION, *Pittsburgh and Chicago*

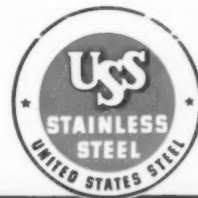
COLUMBIA STEEL COMPANY, *San Francisco*

NATIONAL TUBE COMPANY, *Pittsburgh*

TENNESSEE COAL, IRON & RAILROAD COMPANY, *Birmingham*

United States Steel Supply Company, *Chicago, Warehouse Distributors*

United States Steel Export Company, *New York*



UNITED STATES STEEL

Announcing

A NEW AND DIFFERENT AIR-HARDENING TOOL STEEL

Carpenter

VEGA

U. S. Pat. 2,355,224

Type Analysis:

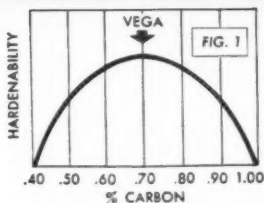
Carbon .....	.70%
Manganese	2.00%
Silicon .....	.30%
Chromium	1.00%
Molybdenum	1.35%

THE CARPENTER STEEL COMPANY • 105 W. BERN ST. • READING, PENNSYLVANIA

BRANCHES AT: Buffalo, Chicago, Cincinnati, Cleveland, Detroit, Hartford, Indianapolis, New York, Philadelphia, Providence, St. Louis

TOOL makers have long expressed the desire for a *tried and proved* non-deforming die steel that would combine the deep-hardening characteristics of air-hardening steels with the simplicity of low temperature heat treatment possible with many oil-hardening steels. VEGA is a new type of air-hardening steel developed in the Carpenter laboratories to meet this need.

HARDENS IN VERY HEAVY SECTIONS



VEGA will harden to Rockwell C-60 from surface to center in sections as large as 8" diameter by cooling from 1550° F in a free circulation of air. In smaller diameters, hardness values will be slightly higher.

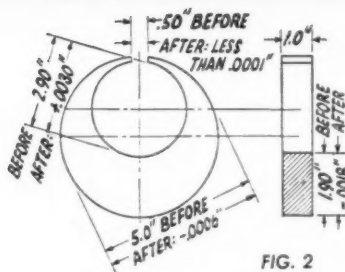
Carpenter's metallurgists discovered that the hardenability of this type of steel is influenced in an unusual way by carbon content. As shown in Fig. 1, maximum hardenability is obtained at a carbon content of about .70%. This is particularly noticeable in heavy sections. Further, percentages of other alloys were proportioned to afford the best combination for maximum hardenability and toughness.

VEGA combines, for the first time, the deep-hardening characteristics of air-hardening steels with the simplified, low temperature heat treatment of many oil-hardening types.

LOW HARDENING TEMPERATURE Pack Hardening Not Required

VEGA can be heat treated from a temperature 200° F lower than the 5% Chrome air-hardening steels. Therefore, pack hardening and special high temperature furnaces are not required. The low temperature also helps to hold size change to a minimum and reduces the tendency to scale.

MINIMUM DISTORTION and SIZE CHANGE



When dimensional changes in heat treatment must be held to an absolute minimum, VEGA should be considered for the job. Properly hardened, VEGA will expand about .0005" per inch of length when air cooled at room temperature. Drawing at 400° F returns it to within .00025" of its original size.

Fig. 2 shows the extent of dimensional change in a Navy Size Change Ring made of VEGA.

VEGA

ALSO GIVES YOU THESE EXCLUSIVE ADVANTAGES

**GOOD MACHINABILITY • FREEDOM from EXCESSIVE SCALING
RESISTANCE to DECARB • EXCELLENT TOUGHNESS**



ASK FOR THIS NEW FOLDER It contains more complete information about VEGA and the jobs it can do for you. Just drop us a line and your VEGA folder will be on its way to you.

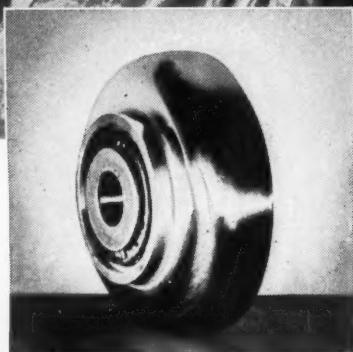
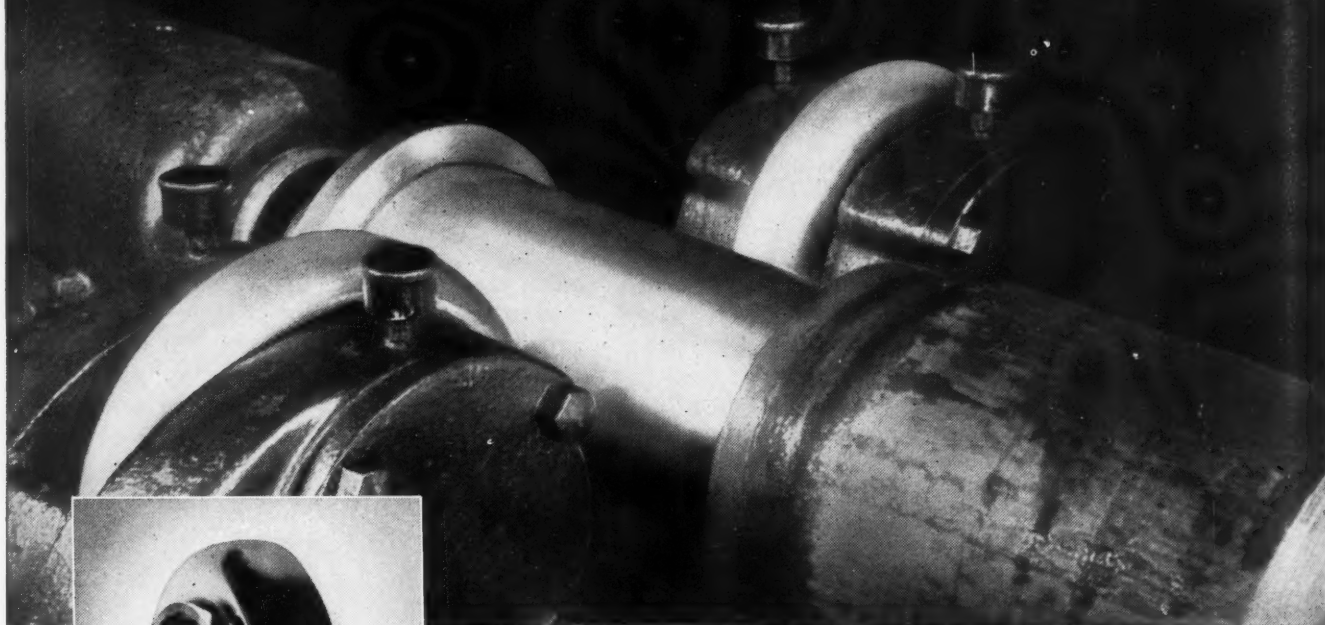


Carpenter

TOOL STEELS

100% ACID-DISC INSPECTED

Because They Resist Wear
and produce an excellent finish



HAYNES STELLITE Burnishing Rollers
are widely used in railroad shops

More than 100,000 car axles have been burnished in one railroad shop with one set of HAYNES STELLITE burnishing rollers. In eight years of hard service these rollers of cobalt-base alloy have required no repair or maintenance, except lubrication.

HAYNES STELLITE rollers not only resist wear, but also retain their high polish, and burnish to a high degree of smoothness. And because they are essentially non-magnetic, they are unlikely to pick up steel particles that will mar the work.

HAYNES STELLITE alloys are used in many tough industrial jobs where hard, abrasion- and corrosion-resistant metals are needed. Our engineers will be glad to help you use them. For further information, write for the booklet, "Products of Haynes Stellite Company."

**In HAYNES STELLITE Alloys
you can get these advantages:**

1. Resistance to wear and abrasion.
2. Hardness even at red heat.
3. Good mechanical properties at high temperatures over long periods of time.
4. Resistance to atmospheric corrosion and corrosive chemicals.
5. Low co-efficient of friction.
6. Practically non-magnetic.
7. Available in the form of castings, small sheets, and welding rod.

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation



General Office and Works, Kokomo, Ind.

Chicago—Cleveland—Detroit—Houston—Los Angeles—New York—
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"Haynes," "Stellite," "Hastelloy," "Hascrome," and "Haystellite"
distinguish products of Haynes Stellite Company.

HAYNES

TRADE-MARK

alloys

*Here is help for you
if you are*

CHROMIUM PLATING

Tools
Gages
Bearings
Cabinet Hardware
Automobile Hardware
Refrigerator Hardware
Electrical Appliances
Building Hardware
Plumbing Fixtures
Stove Hardware
Piston Rings
Dies

Good results in ornamental, industrial or porous chromium plating depend to an important degree on proper preparation of the base steel. Surfaces must be **CHEMICALLY CLEAN** in order to assure maximum deposit adhesion. You can be sure of the thoroughness of your preliminary surface cleaning process by following the successful example of many leading platers who use that fast-acting, low-cost Oakite material especially designed for ANODIC degreasing . . .

OAKITE COMPOSITION No. 90

The highly effective wetting-out, emulsifying and penetrating properties of this material quickly remove insoluble smut, oil, grease, shop dirt and similar foreign matter. The resulting **CHEMICALLY CLEAN** surfaces provide uniform, durable chrome deposits on ferrous metals. For plating on non-ferrous metals equally effective Oakite materials are available. Complete technical data gladly supplied on request.

Put Oakite Technical Service To Work In Your Plant

A 16-page booklet describing Oakite Composition No. 90 may be had **FREE** on request. In addition, the personal services of your nearby Oakite Technical Representative are available to you entirely without cost or obligation. Since one of your important objectives today is to concentrate on finding methods for keeping production costs low, let us help you in the same successful way that we have helped so many other platers. Your inquiries concerning cleaning before plating are invited. . . . Write **TODAY!**

OAKITE PRODUCTS, INC., 26 Thames St., NEW YORK 6, N. Y.
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OAKITE *Specialized* **CLEANING**
Machinery Age & Feb 1947
MATERIALS • METHODS • SERVICE



- The widespread use of triple-alloy steels containing Nickel, chromium and molybdenum is based on extensive experience in widely divergent engineering fields.

It has been found that they can be counted on for consistent performance. The depth to which full hardness is developed is comparable to that attained by other alloy steels. Their response to heat treatment is dependably uniform.

Moreover, the wide range of compositions available, makes it possible to select *accurately* suitable alloy steels for a broad range of applications.

Inquiries regarding the selection and uses of triple-alloy steels containing Nickel are invited.

THE INTERNATIONAL NICKEL COMPANY, INC. 67 Wall Street
New York 5, N.Y.

RUSTLESS DATA SHEET NO. 1

Why use RUSTLESS Stainless Steels?

For innumerable applications, stainless steels are the most economic engineering materials known.

A few of the many advantages of using Stainless Steels are . . .

DURABILITY

Stainless Steels have remarkable resistance to a wide variety of corrosion conditions and to the effects of high temperature exposure; no plating to peel or wear off; no paint to chip; possess resistance to abrasion and erosion and eliminate contamination.

STRENGTH

Over a wide temperature range Stainless Steels, depending upon grade and size, offer: tensile strengths ranging from 70,000 to 300,000 pounds per square inch; high yield strengths; high strength-weight ratios, thus permitting lighter, safer, and more dependable structures.

TOUGHNESS

Stainless Steels will absorb great shock loads even at extremely low temperatures and have exceptional endurance strength; yet they can be machined, formed and welded with ease.

ECONOMY

In spite of somewhat higher initial cost compared to ordinary steel, Stainless Steel products have long life at low maintenance which results in best overall economy. Fabrication costs which often constitute the bulk of total costs can be reduced by the application of proper techniques.

STIFFNESS

With high elastic moduli, Stainless Steels have nearly twice the rigidity of copper base alloys—three times that of aluminum—five times that of magnesium—and many times that of plastics. This is important when designing for minimum space.

SALES APPEAL

The clean, bright surface of Stainless Steels has captivated public acceptance for appearance, sanitation and utility. Consumer articles marked "Stainless" sell quickly. Process equipment made of Stainless induces cleanliness, efficiency and better working conditions.

HOW TO SELECT THE PROPER STAINLESS GRADES

There are many grades of Stainless Steels. Each has its own composition, physical characteristics, mechanical properties and degree of corrosion resistance and workability.

Because the characteristics of Stainless Steels differ from one another and from other materials, you will want to consult Rustless—America's specialists in Stainless Steels

—for data and experience necessary for proper design and selection.

All Stainless Steels contain as a basic ingredient ten percent or more chromium. It is this element which produces the corrosion and scale resisting properties. Such elements as nickel, molybdenum, columbium, titanium and several others contribute special attributes.

THERE ARE THREE BASIC GROUPS OF STAINLESS STEELS

Straight Chromium—Hardenable by Heat Treatment

Rustless 12	Type 410
Rustless 12T	Type 403
Rustless 12FM	Type 416
Rustless 13-C-35	Type 420
Rustless 13-C-35FM	Type 420F
Rustless 16-2	Type 431
Rustless 17-C-60	Type 440A
Rustless 17-C-80	Type 440B
Rustless 17-C-100	Type 400C
Rustless 17-C-100FM	Type 440FM

A wide range of physical properties may be obtained by quenching from hardening heat. The high carbon grades are generally used in the hardened and stress-relieved condition.

Straight Chromium—Non-Hardenable

Rustless 17	Type 430
Rustless 17FM	Type 430F
Rustless 21	Type 442
Rustless 27	Type 446

Superior in corrosion resistance to above group. Generally used in annealed or soft condition.

Chromium-Nickel—Hardenable by Cold Work Only

Rustless 18-8	Type 302
Rustless 18-8	Type 304
Rustless 18-8FM	Type 303
Rustless 25-12	Type 309
Rustless 18-12-3Mo.	Type 316
Rustless 18-10-Ti	Type 321
Rustless 18-10Cb	Type 347

Highest corrosion resistance of all. Non-magnetic when annealed, becoming magnetic as cold worked. Exhibit extraordinary resistance to stress concentration.



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STAINLESS STEEL SPECIALISTS
RUSTLESS IRON AND STEEL DIVISION
The American Rolling Mill Company
BALTIMORE 13, MARYLAND

MACHINERY, March, 1946—97

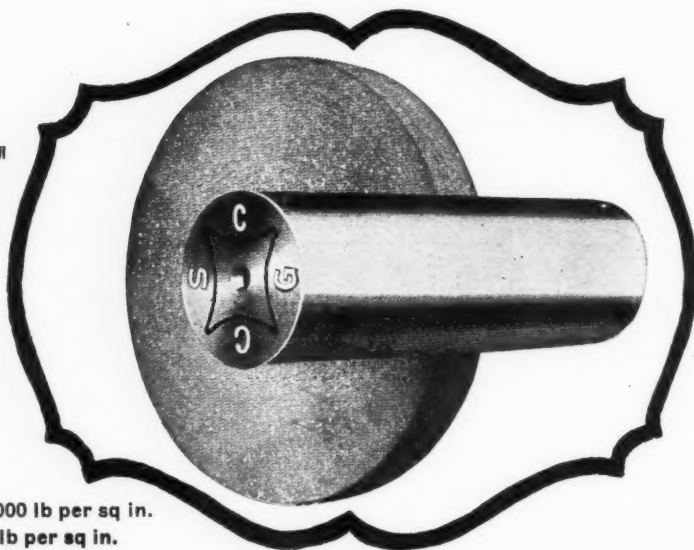
CUMBERLAND GROUND SHAFTS

An Exclusive Product made by an Exclusive Method

DIAMETERS 1-1/8" to 8"
INCLUSIVE

MINIMUM
ELASTIC
LIMIT

Cumberland Brand—30,000 lb per sq in.
Potomac Brand—45,000 lb per sq in.
Cumsco Brand—55,000 lb per sq in.



CONCENTRIC
STRAIGHT
ACCURATE

MAXIMUM
LENGTHS
MANUFACTURED

Year 1845—up to 16 feet
Year 1886—up to 25 feet
Year 1945—up to 70 feet

They are carefully ground to our standard manufacturing tolerance, plus nothing to minus .002" on diameters 1-1/8" to 2-7/16" inclusive . . . plus nothing to minus .003" on diameters 2-1/2" to 8" inclusive. Closer tolerance can be furnished, if desired.

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CUMBERLAND STEEL COMPANY

CUMBERLAND, MARYLAND, U. S. A.
ESTABLISHED 1845 INCORPORATED 1902



HERE'S THE *"What, Why and How"* OF **ALLEGHENY METAL**

★ **ALLEGHENY METAL**, the time-tested stainless steel, is produced in types and grades to meet any ordinary or special requirement, and in all necessary forms and shapes—backed by any needed assistance from our Technical or Research Staffs.

★ *Allegheny Metal* is also handled and carried in stock by all Ryerson warehouses.

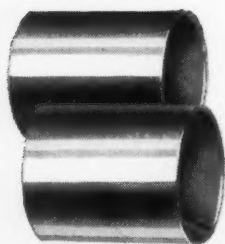
ALL the various commercial grades of stainless steel have reason and meaning. Here's the data you need to match up the proper grade of Allegheny Metal with the product whose efficiency, appearance or service life you want to improve . . . the problem of corrosion and heat resistance, sanitation or maintenance you want to solve . . . the methods of fabrication you need to use. You'll find this new 100-page Handbook an invaluable mine of handy information.

write for your copy . . . Address Dept. M-39

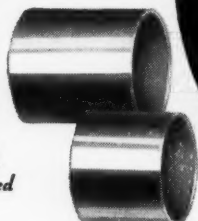
ALLEGHENY LUDLUM

STEEL CORPORATION · General Offices, Brackenridge, Pa.

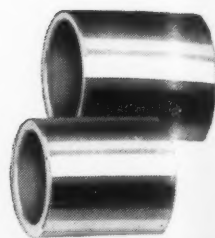
Pioneer in Specialloy Steels



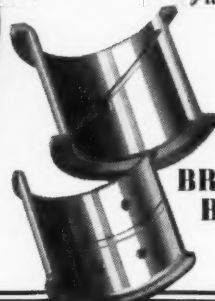
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Plain or graphited



BRONZE ON STEEL
Plain or graphited



CAST BRONZE
Plain or graphited



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RIGHT BEARING
for each
Application

Johnson Bronze helps Manufacturers
make the RIGHT choice

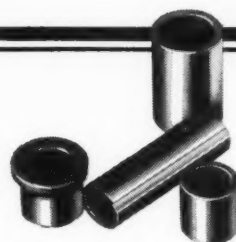


STEEL and BABBITT

One easy way to improve the performance of any motive unit is to check up on the bearings. Determine if they are the right type . . . correct in design . . . properly installed. See if they reduce friction to the very minimum . . . eliminate vibration . . . perform quietly for the longest period of time.

The easiest way to determine this is to call in a Johnson Bronze Engineer. Permit him to review your applications . . . to study the operating conditions. As we manufacture *all* types of Sleeve Bearings, we base our recommendations on facts . . . free from prejudice . . . backed by more than forty years exclusive bearing experience. You will find a Johnson Engineer as near as your telephone. Why not get together TODAY?

JOHNSON BRONZE CO.
520 S. MILL STREET
NEW CASTLE, PA.



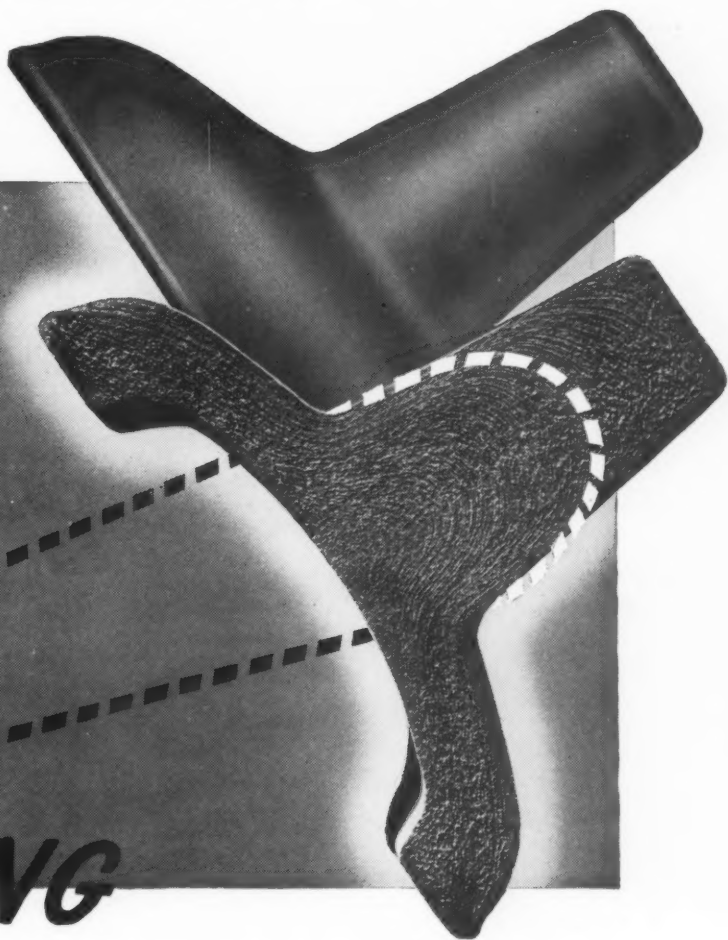
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Self-Lubricating

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ONE PURPOSE THE IMPROVEMENT OF METALS By FORGING



The vital elements in the development of maximum metal quality in forging are engineering and production experience—experience in utilizing fully the fibre-like flow line structure of wrought metals, plus experience in the selection of the correct forging technique for obtaining maximum tensile and impact strength, toughness and fatigue resistance. A Steel Improvement Forging Engineer represents over 31 years of venturesome technical and forging production effort devoted to one purpose—THE IMPROVEMENT OF METALS BY FORGING. Ask a Steel Improvement Engineer about forging techniques and procedures by which numerous so-called "impossible-to-forge" designs are being successfully forged. A product fortified by forging outperforms other products.

Reference Data Booklet presents many new ideas on forgings and their application in many different types of equipment. Copies available to engineers, metallurgists and executives.



THE STEEL IMPROVEMENT & FORGE CO.
978 East 64th Street CLEVELAND, OHIO

THIS specification covers a Nickel-Molybdenum iron, with ladle treatment, and the necessary heat treatment when required, to bring about an acicular microstructure of high tensile strength. (By special heat treatments, tensile strengths of 75,000 lbs. and over may be obtained.) Applications where this alloy have been profitably used are shown at right.

Bulletin 194 will give you full information on the complete line of Cramp Alloys for industrial and engineering applications, and on our unusual facilities for handling all varieties of small castings in any quantity. Write for a copy. The Baldwin Locomotive Works, Cramp Brass & Iron Foundries Division, Philadelphia 42, Pa., U. S. A. Offices: Philadelphia, New York, Chicago, St. Louis, Washington, Boston, San Francisco, Cleveland, Detroit, Pittsburgh, Houston, Birmingham, Norfolk.



BALDWIN

CRAMP NI-IRON

CASTINGS



Recommended for

CRANKSHAFTS

HYDRAULIC CYLINDERS

RAMS

CAM SHAFTS

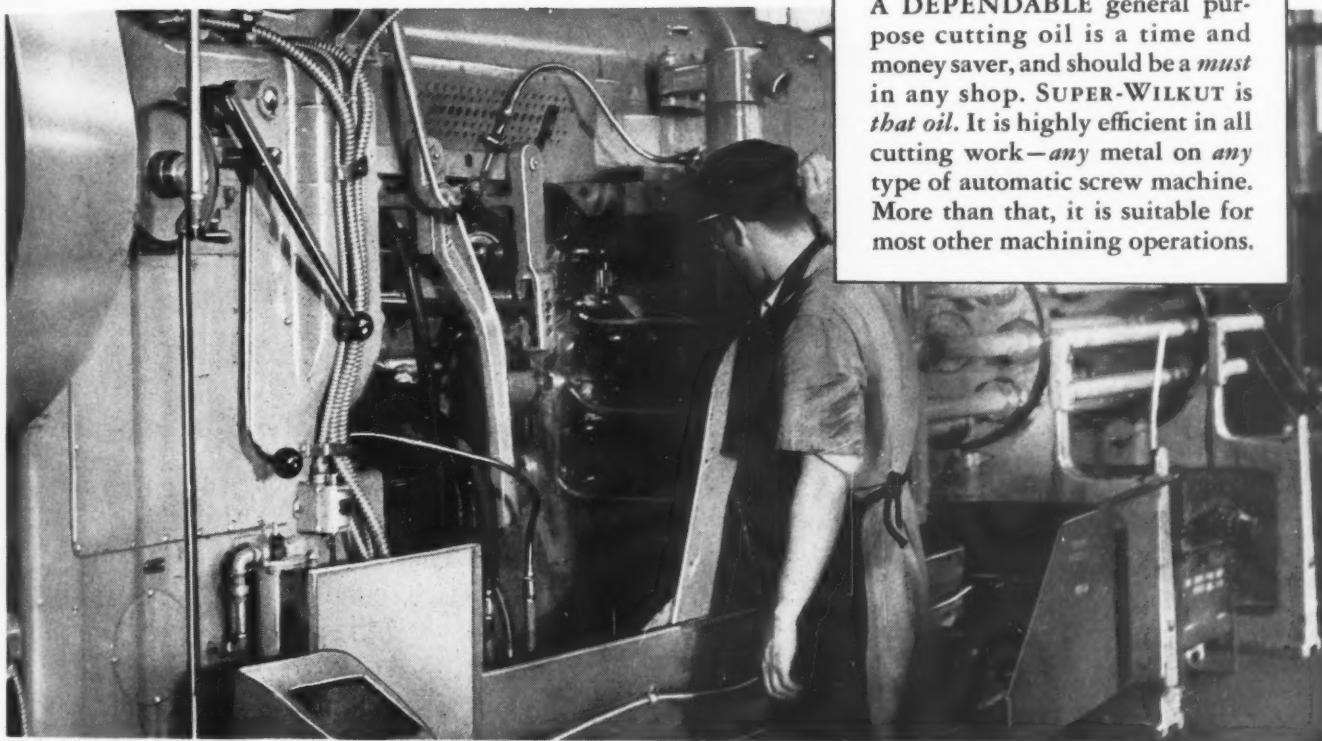
GEARS

STEEL MILL ROLLS

DIES

HEAVY MACHINERY PARTS

FOR ANY METAL ON ANY AUTOMATIC



A DEPENDABLE general purpose cutting oil is a time and money saver, and should be a *must* in any shop. SUPER-WILKUT is *that* oil. It is highly efficient in all cutting work—*any* metal on *any* type of automatic screw machine. More than that, it is suitable for most other machining operations.

SINCLAIR SUPER-WILKUT

SINCLAIR SUPER-WILKUT is a sulphurized cutting oil, *but*, unlike the usual sulphurized oils, it can be used with equally satisfactory results on both ferrous and *non-ferrous* metals. SUPER-WILKUT is specially compounded to be non-staining and *non-corrosive*, making it particularly suitable for automatics with bronze bearings. Its anti-weld properties are another obvious advantage in metal cutting work.

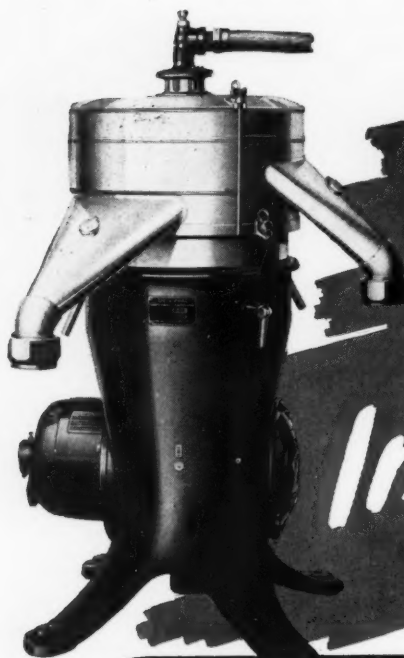
One evidence of SUPER-WILKUT's all-around satisfactory performance: It has been in general purpose use for years in a series of important plants that were expanded from a small shop started with three Brown & Sharpe automatics—and SUPER-WILKUT.

Wouldn't SUPER-WILKUT help solve problems in your machining operations?

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.

MACHINERY, March, 1946—103



**WHERE CLEAN, DRY
OIL IS ESSENTIAL...
Install a DE LAVAL**

**A Few Applications
for DE LAVAL Oil Purifiers
in Metal-Working Plants**

BALER OIL
BORING OIL
BRIQUETTING OIL
CABLE OIL
CUTTING OIL
DRAWING OIL
ENGINE OIL
GRINDING COOLANT
HONING OIL
HYDRAULIC OIL
LUBRICATING OIL
MOTOR BLOCK TEST OIL
QUENCHING OIL
RECOIL OIL
SHOCK ABSORBER OIL
SLUSHING OIL
TRANSMISSION OIL
WASHING OIL

**... AND IN THE POWER PLANT
LUBRICATING OIL!**

ALMOST every metal-working plant has one or more operations where an adequate supply of clean dry oil is a virtual necessity. The list at the left suggests just a few of them.

Where *clean* oil is the prime requisite, De Laval Oil Purifiers remove foreign impurities such as dirt, abrasive or metallic particles and restore the oil to "like-new" purity. Because of the greater intensity of centrifugal force, De Laval machines are more thorough than other means.

Where *dryness* is the vital consideration, as in the case of slushing oil, De Laval Purifiers remove every bit of water, whether it amounts to a few teaspoonsful or a bucketful. The oil is instantaneously dehydrated in the bowl of the De Laval centrifugal, enabling the parts being slushed to get the full benefit of clean, dry oil.

And where *speed* of purification is the chief factor, De Lavals answer the need especially well, for they discharge clean dry oil *continuously*. They eliminate maintenance slow-ups.

Write for Bulletin MM-1, indicating which application you are chiefly interested in.

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 19

THE DE LAVAL COMPANY, Limited
MONTREAL PETERBOROUGH WINNIPEG VANCOUVER

DE LAVAL

**PURIFIERS and
CLARIFIERS for
FACTORY OILS**

FOR GREATER OPERATING EFFICIENCY

Performance—Economy ..

One source of supply

Collets and Feed Fingers for all makes of
Automatics, Chucking Machines and Turret Lathes



*Draw it
Hydraulically!*



Above is illustrated the results of a single draw in an H-P-M press installed in the plant of Benjamin Electric Company, Des Plaines, Illinois. Blank size — 44" dia. (19 gauge steel). Tub size — 23" dia. x 15-5/16" deep. Production averages 100 tubs per hour. Die cushion pressure embosses bottom of tub at start of draw, eliminating the need for additional embossing operations.

A COMPLETE WASHING MACHINE TUB IN ONE DRAW !

The best way to reduce your metal working costs is to reduce the number of drawing operations. This not only speeds-up production, but greatly reduces your manufacturing overheads . . . fewer dies, less press equipment, smaller factory space and less manpower. In a majority of cases where deep sheet metal drawing operations are involved, H-P-M "All-Hydraulic" presses will permit you to draw parts with fewer operations, and at the same time keep rejects to a minimum.

The H-P-M FASTRAVERSE press has great versatility of control, permitting the press to be easily and quickly adjusted to meet the specific requirements of each draw job. Absolute control of the drawing speed at a constant value, plus total elimination of high impact stresses guarantees proper metal flow. Independent pressure control of each hydraulic action . . . punch carrying slide, blankholder and die cushion, provides just the right tonnage for each job.

Automatic reversal of the press at a pre-determined pressure insures uniform results, and protects both dies and press. The fact that maximum pressure can be secured at any point within the limits of the press stroke greatly increases the scope of operations. Investigate these revolutionary "All-Hydraulic" production units. Draw your sheet metal parts hydraulically.

The Hydraulic Press Mfg. Co.

Mount Gilead, Ohio, U. S. A.

Branch Offices in New York, Philadelphia, Cleveland, Detroit, and Chicago. Representatives in other principal cities.



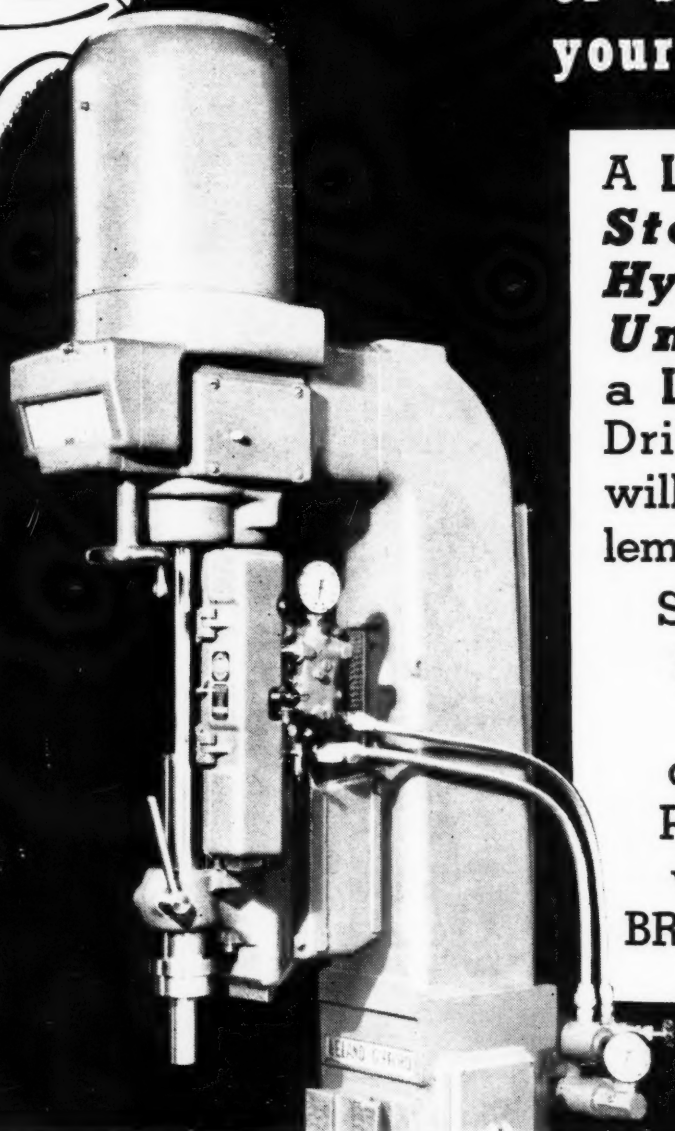
All - Hydraulic
FASTRAVERSE PRESSES

ONIZING PRODUCTION WITH HYDRAULICS SINCE 1877

DOES A SMALL DEEP HOLE



in some part slow
your production
or skyrocket
your costs?*



**A LELAND-GIFFORD
Step by Step
Hydraulic Feed
Unit** applied to
a **LELAND-GIFFORD**
Drilling Machine
will solve the prob-
lem and give . . .

**STRAIGHTER,
SMOOTHER
HOLES**
and **HIGHER
PRODUCTION**
with **FEWER
BROKEN DRILLS.**

Bulletins on request

LELAND-GIFFORD

WORCESTER 1, MASSACHUSETTS, U. S. A.

Producing Trailer Axles

FROM 2 INCH BAR STOCK TO CLOSE TOLERANCES AT THE RATE
OF 8 MIN. PER OPERATION ON THE **BARDONS & OLIVER**
NO. 5 UNIVERSAL TURRET LATHE



...is an easy job at Patton Co.,
Cleveland, Ohio.

Standard turret tools are used
very effectively.

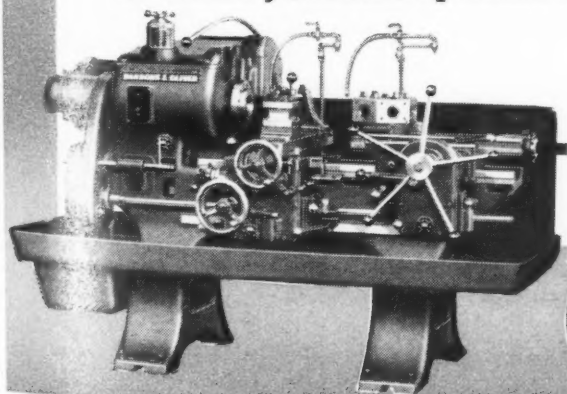
The hydraulic speed pre-select-
or and hydraulic spindle brake

reduce time between cuts and
save the operator's strength.

Hardened alloy steel bedways
and wear strips on both slide
and saddle preserve the inbuilt
accuracy of the machine.

Many outstanding features
make this machine excel on
both bar and chucking work.

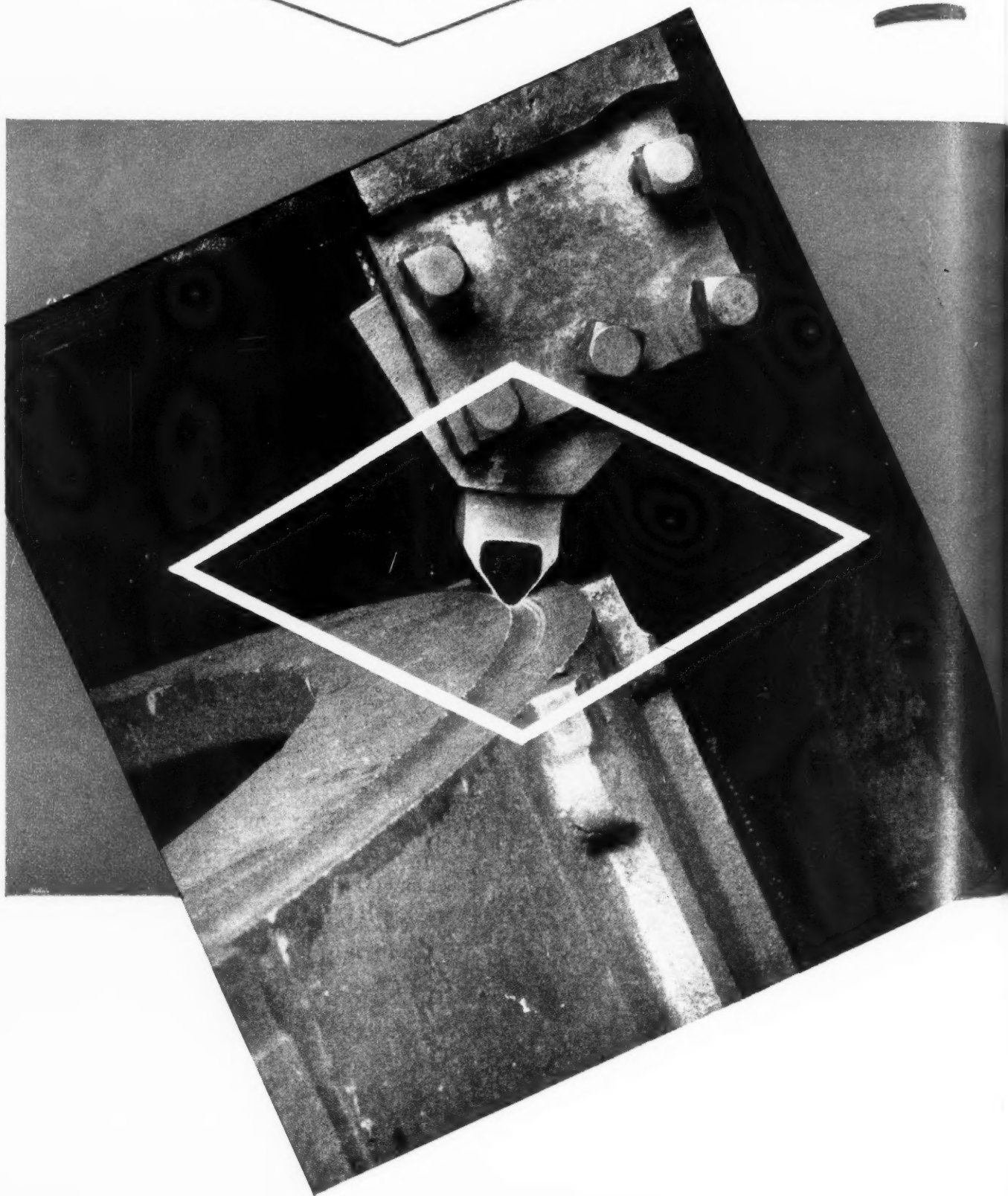
WRITE FOR CIRCULAR



BARDONS & OLIVER, INC.

1133 WEST 9TH STREET • CLEVELAND 13, OHIO

FIRTHITE faced 32



instead of 6 pieces per grind

Conditions:

- Depth of cut $3/8''$
- Feed per revolution $1/32''$
- Cutting speed 235 feet per minute

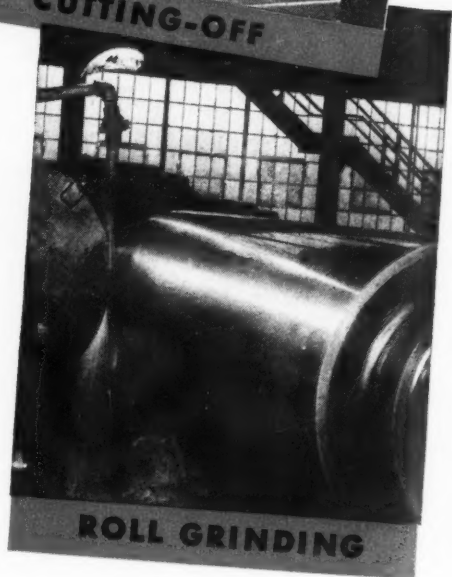
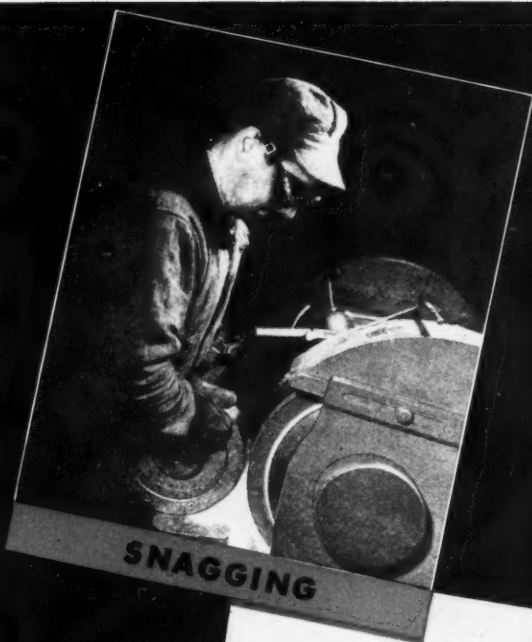
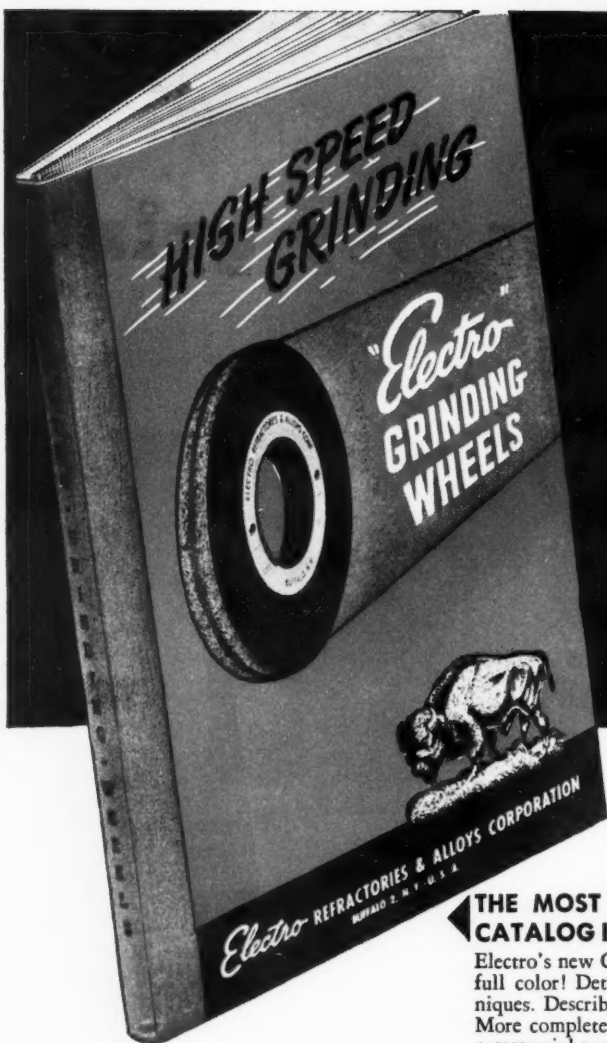
Cutting speed was also increased from 100 feet per minute to 235 feet per minute.

No wonder the customer said, "A marvelous work value on this job."

***If YOU have a
cutting problem . . .***

Call ***Firth-Sterling***
STEEL COMPANY

PA: Keesport, Pa.—New York, Hartford, Philadelphia, Pittsburgh, Cleveland, Dayton, Detroit, Chicago, Los Angeles



THE MOST TALKED-OF CATALOG IN INDUSTRY

Electro's new Catalog 645. Illustrated in full color! Details latest grinding techniques. Describes newest grinding tools. More complete and up-to-date than any commercial textbook! Free copy to you if requested on company letterhead.

Electro GRINDING WHEELS CUT HARD METALS FASTER!

—and they cut them cooler, cleaner and safer! We've raised their efficiency to a new high by *precision* processing of the abrasive grits. We've minimized density variations until they're practically non-existent. Vibration—principal cause of ragged cutting, faulty finishing, wheel breakage and occupational accidents, disappeared in direct proportion to Electro's new achievements in uniformity of grit selection; density, balance and truth; and with strengthening of the bonds. Electro is away out in front again with these new wheels! We'll welcome opportunity to prove it with operating tests in your own plant. Spot service from Buffalo with stocks in Los Angeles. Phone us NOW! Buffalo, WASHington 5259; Los Angeles Kimball 9209



Electro REFRACTORIES & ALLOYS CORPORATION

MFRS. • REFRACTORIES • CRUCIBLES • STOPPERS • ALLOYS • GRINDING WHEELS
344 DELAWARE AVENUE West Coast Warehouse Los Angeles BUFFALO 2, NEW YORK

INGERSOLL FACE MILL CUTTERS

Available from Stock



TYPE NX Heavy Duty Series race milling cutters designed for general purpose work are suitable for taking $\frac{1}{2}$ " cuts on both the face and periphery in cast iron or steel. Serrated high speed steel blades are locked in the cutter housing by wedges and screws. Chip clearance is milled in the housing to prevent chips clogging on heavy cuts. The following sizes are available in stock both right and left hand.

Cutter No.	Diameter	No. Blades	Cutting Face on Periphery	Price
8104X	4"	10	1- $\frac{3}{4}$ "	\$30.00
8106X	6"	10	2- $\frac{1}{2}$ "	35.00
8108X	8"	14	2- $\frac{1}{2}$ "	45.00
8110X	10"	18	2- $\frac{1}{2}$ "	60.00
8112X	12"	20	2- $\frac{1}{2}$ "	78.00

SHEAR CLEAR Heavy Duty Series face milling cutters will out-perform any existing designs for work in tough steel and in the soft, stringy, non-ferrous metals. Designed for $\frac{1}{2}$ " deep cuts. The Shear Clear is a patented design using steep negative rake and positive shear angles which cause chips to coil outward away from the cutter. The following sizes with high speed steel blades are available in stock both right and left hand:

Cutter No.	Diameter	No. Blades	Price
7106X	6"	12	\$58.00
7108X	8"	16	75.00
7110X	10"	20	100.00
7112X	12"	22	120.00



Write for catalog giving complete details on inserted blade milling and boring tools.

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

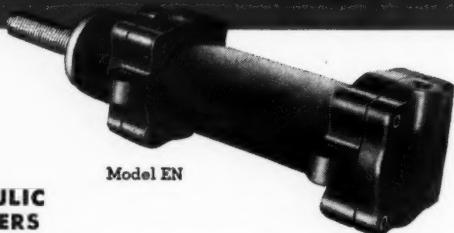
HANNIFIN

PNEUMATIC AND HYDRAULIC EQUIPMENT

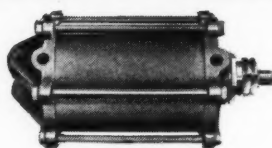
HYDRAULIC CYLINDERS

with patented "no-tie-rod" design, providing a stronger cylinder assembly, simpler to apply, assuring high efficiency operation. End caps may be positioned independently, without disturbing mounting for simple, efficient piping. Mirror finish honing gives a cylinder bore that is straight, round, perfectly finished. High efficiency piston seal with minimum fluid slip is assured. Seven standard mounting types; special mountings and large sizes built to order.

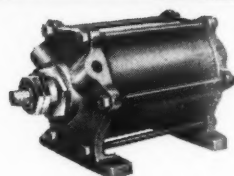
Model EN



Model BR



Model CR

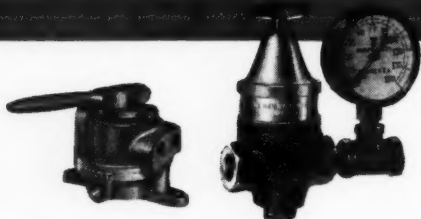


PNEUMATIC CYLINDERS

provide simple outside adjustment of the soft piston packing, allowing easy maintenance of the high efficiency piston seal with minimum friction loss. All sizes are bored and honed for straight, round, mirror finish cylinder bore—a better finish that means better cylinder performance. Built in a full line of standard mountings, sizes 1 to 16 inch bore, for any length stroke, with or without cushion.

AIR CONTROL VALVES

disc type for positive, accurate control of air operated equipment. Efficient disc type design without packing prevents leakage and waste of air power, does away with packing maintenance troubles. The bronze disc controlling air flow is ground and lapped to make a perfect seal with the valve seat. Made in 3-way and 4-way types for control of single and double acting cylinders in hand or foot models, spring return, heavy duty rotary, manifold, and electric models. Also piston type pressure regulating valves.



"HY-POWER" HYDRAULIC RIVETERS

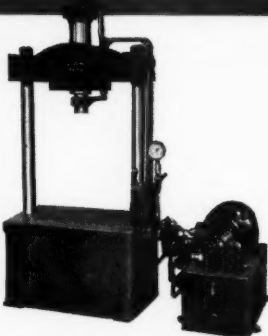
for high speed production riveting, punching, pressing. Portable and stationary types available, designed for easy handling and consistent rapid production. Capacities 7½ to 100 tons. The automatic operating cycle is push-button controlled and includes rapid advance stroke, automatic high pressure working stroke, automatic reversal, rapid return stroke. The hydraulic pressure generator is a compact motor driven unit. "Hy-Power" equipment is adaptable to a wide range of riveting, punching, and pressing operations.



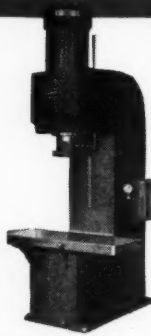
HYDRAULIC PRESSES

available in 2, 3, 4 column, and open gap types, capacities 5 tons to 150 tons, for straightening, forming, press assembly and similar operations involving the application of pressure. Column spacing, ram stroke, table construction, speeds, and controls may be readily modified to suit individual needs.

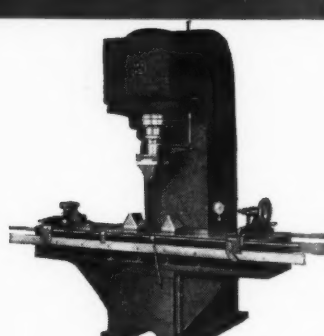
COLUMN TYPE available in a wide range of types and sizes. This 10 ton two column press with sensitive pressure control is ideal for accurate pressing and assembly operations.



FORCING PRESSES built in many sizes and types, with control and table design to suit individual needs. This 75 ton press has sensitive pressure control and is adapted to general press-fit assembly, forcing and forming operations.



STRAIGHTENING PRESSES designed for rapid, accurate production straightening. This 100 ton press has sensitive pressure control, long table and center type fixture.



HANNIFIN MANUFACTURING COMPANY • 621 S. KOLMAR AVENUE • CHICAGO 24, ILLINOIS

ACCURACY — ***Demands these Tools—***

In almost every field of manufacture, production is assisted — nay, maintained, both in rate and in quality by precision tools. With Brown & Sharpe Tools to define measurements, the maintenance of the accuracy required in manufactured goods is simplified — manufacturing costs kept within minimum limits.

"The Choice of Over Three Generations of Machinists"

**Styles and Sizes
for Most
Requirements**

MICROMETER TOOLS
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CALIPERS and DIVIDERS

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BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U.S.A.



*We urge buying
through the Distributor*

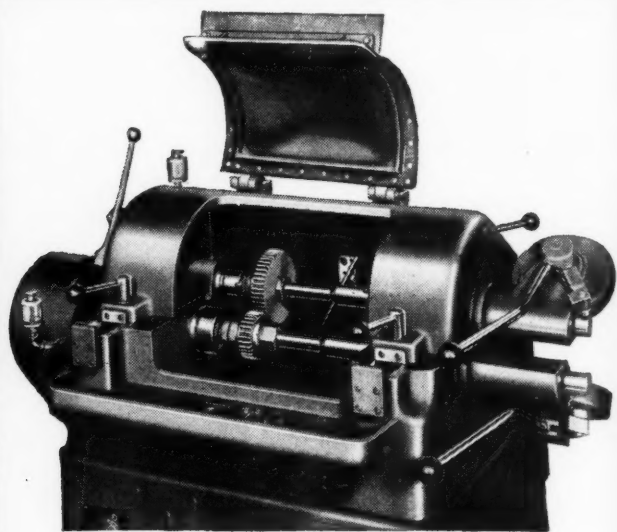
BROWN & SHARPE TOOLS

Don't Let NOISY GEARS Reach Assembly

There is no excuse for incorporating noisy gears in any assembly where gear noise cannot be tolerated. Find out before those gears reach assembly whether or not they are noisy and avoid the necessity of tearing down the assembly in order to replace them with quiet gears.

That is precisely the function of The Red Ring Gear Sound Tester. It will always spot noisy gears. Furthermore, it will indicate the nature of the trouble which causes the noise so that it can be corrected.

The acoustical horn of this machine amplifies gear noise 50 times. Center distance between gears in the sound chamber may readily be set with precision gage blocks. Gears may be tested either with or without brake load.



NATIONAL BROACH AND MACHINE CO.

1806

5600 ST. JEAN

RED RING  PRODUCTS

DETROIT 13, MICH.

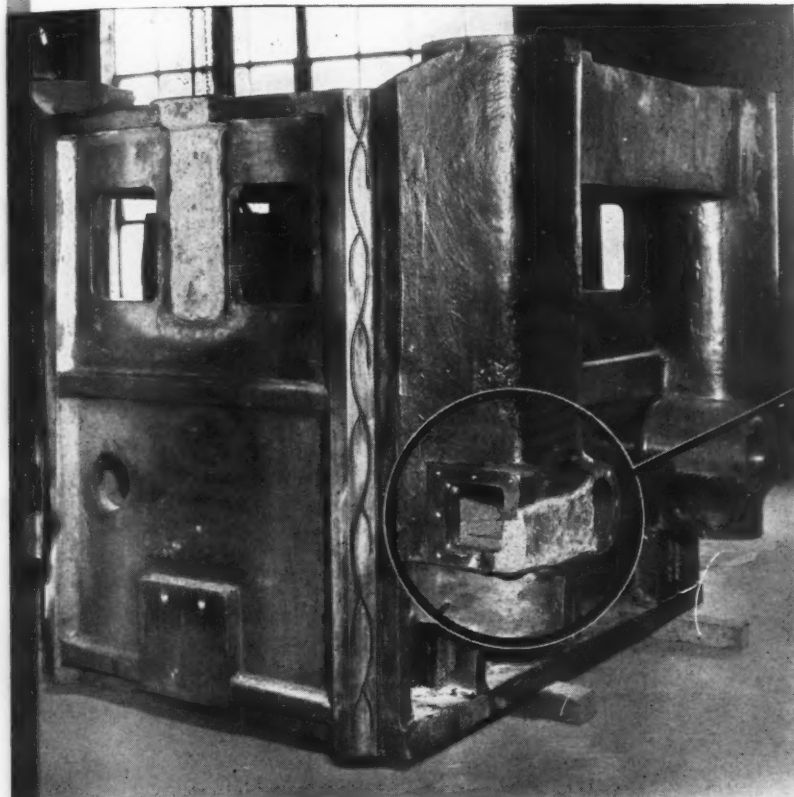
SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE

ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

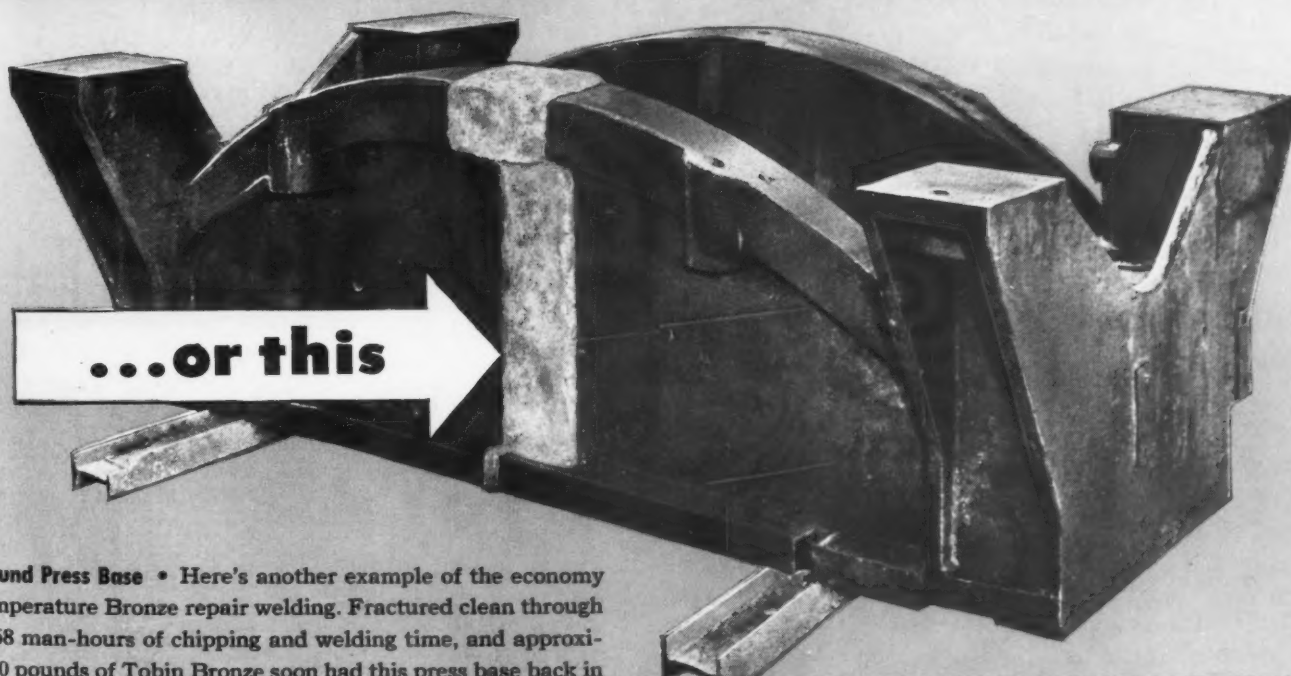
BRONZE WELDING-

First Aid for repairs

...on big jobs like this



18,500-pound Hydraulic Press Casting • 350 pounds of Tobin* Bronze saved this expensive piece of automobile production equipment from the scrap pile. Two hydraulic cylinders were repaired as illustrated at the left, and in the close-up above. The casting was received on a Friday, repair-welded over the week-end, and delivered to the customer on Monday morning ready for machining. The Bronze weld in the frame had been made several years ago and has stood up under heavy production ever since.



...or this

10,250-pound Press Base • Here's another example of the economy of low-temperature Bronze repair welding. Fractured clean through the web, 68 man-hours of chipping and welding time, and approximately 300 pounds of Tobin Bronze soon had this press base back in production on automobile bodies. Both this job and the one above were repaired by the Super Arc Welding Company of Detroit. Other illustrations of Bronze welding appear on the following page.

*Reg. U.S. Pat. Off.

or little jobs like this..

DON'T SCRAP IT! BRONZE WELD IT!



The illustrations above and on the previous page are typical of the equipment on which economical, permanent repairs can be made with Tobin* Bronze, "997" (Low Fuming) and other Anaconda Bronze Welding Rods.

For years this method of low-temperature repair welding has been used by many shops for reclaiming broken, fractured or worn equipment, or for building up bearing surfaces. Almost any part made of cast iron, steel, malleable iron or copper alloys can be Bronze welded quickly, dependably, and at a fraction of the cost of new replacement parts.

If you have war-worn machinery, machine tools or mechanical equipment to put back in shape, and your shop is not equipped to do its own Bronze repair welding, check with your directory or the nearest Office or Agency of The American Brass Company. There are dependable Bronze welding repair shops in most industrial areas.

Publication B-13 will tell you more about Anaconda Welding Rods for oxy-acetylene repair and construction work, and electric welding of copper and copper base alloys. A copy of this booklet will be sent on request.

48153

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut • Subsidiary of Anaconda Copper Mining Company

In Canada: ANACONDA AMERICAN BRASS LTD., New Toronto, Ont.

Quick Repairs to Propellers • Damaged bronze propellers that come into ship-repair shops must be put back in service with minimum loss of time. Here, at the Sullivan Dry Dock and Repair Corporation in Brooklyn, they are speedily and thoroughly reconditioned . . . with tough, sound welds of Tobin Bronze. Worn and slightly damaged edges are built up with weld metal. When a large section of a blade is broken or damaged beyond reclaiming, it is sawed off, and a piece of wrought bronze plate or a segment cast to shape is then welded into place.

*Reg. U.S. Pat. Off.



Anaconda Bronze Welding Rods



INSIST ON *haskins* QUALITY

Haskins Flexible Shaft Machines meet the demands of modern competition. They are quality machines—built of quality material by men of experience, experts in their line. The flexible core, made of special Swedish music wire—the heavy duty rubber fabric casing—the removable casing ends—the ball bearing grease-sealed spindle—the amply-powered motor—these are outstanding features.

And there are literally hundreds of specific operations for these portable tools . . . grinding, drum and disc sanding, rotary filing, wire brushing, buffing and polishing. But whatever the job, a Haskins will do it better—speedily and economically, yet carefully and accurately, too. Send for details.



R. G. HASKINS COMPANY
617 S. CALIFORNIA AVE. • CHICAGO 12, ILLINOIS

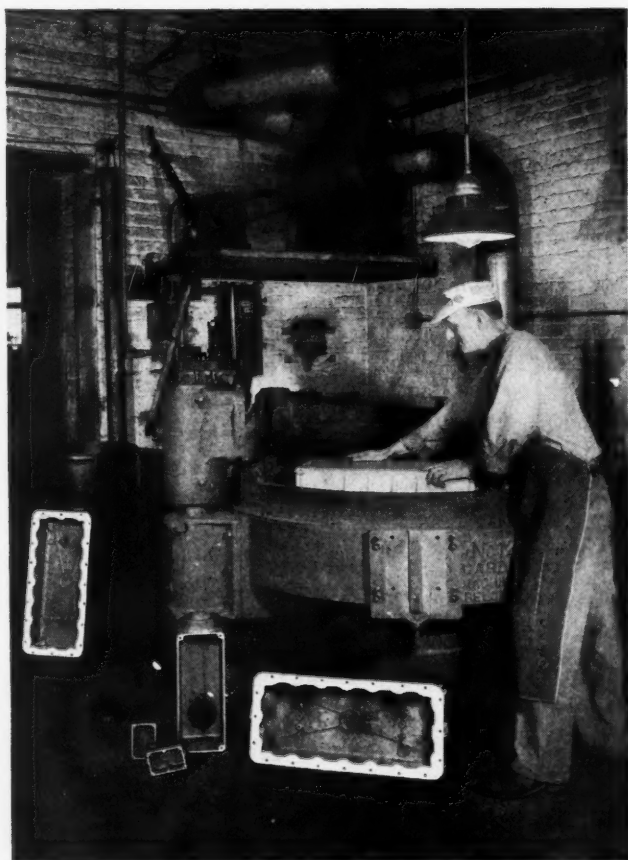
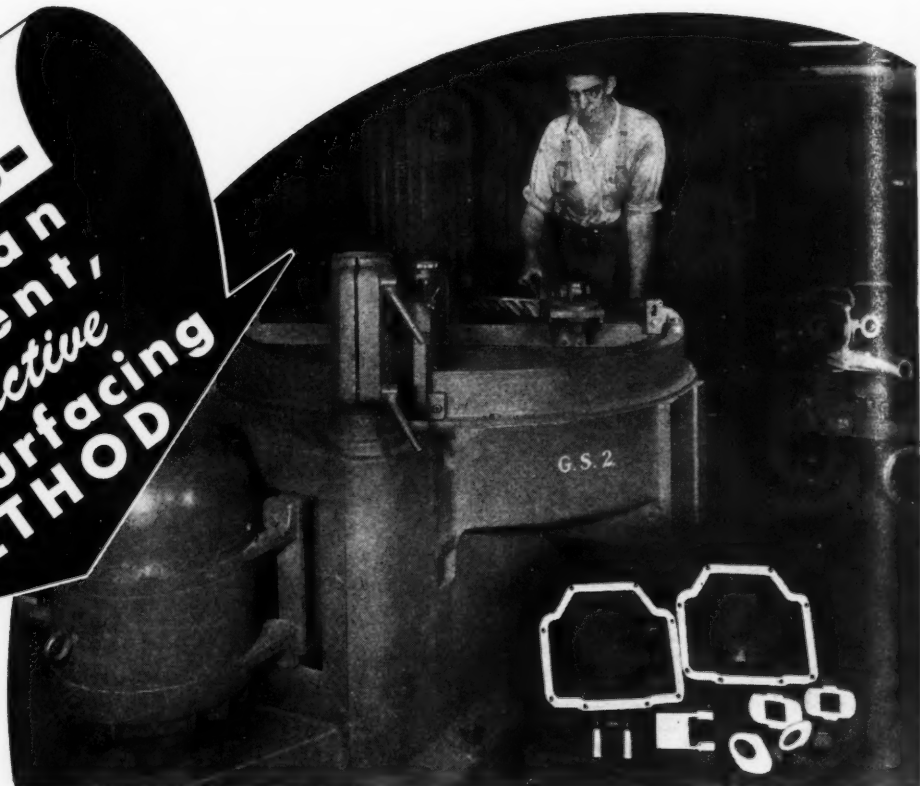
haskins

FLEXIBLE SHAFT EQUIPMENT



HS-4, ½ h.p. multi-speed, countershaft unit, 1800 to 7200 R.P.M., mounted bench height on caster base, 360° swivel.

T O D A Y -
as for years -
STILL an
efficient,
productive
Flat-Surfacing
METHOD



HORIZONTAL DISC GRINDING — for over 31 years, the simplest method of quickly and easily producing true, flat surfaces — still is ideal for flat-surfacing both large and small parts. On a wide variety of jobs requiring only a good, flat surface, thus being ground free-hand by semi-skilled labor, the flexibility of GARDNER Horizontal Disc GRINDERS is setting high production records at low cost. Two typical examples of GARDNER efficiency and economy are shown here:

ABOVE: A No. 124-53" GARDNER Horizontal Disc GRINDER is shown flat-surfacing transmission covers, spring hangers and hose connections at the rate of 20 to 30 per hour on the large parts, and 90 to 100 per hour on the small castings. All parts are cleaned up.

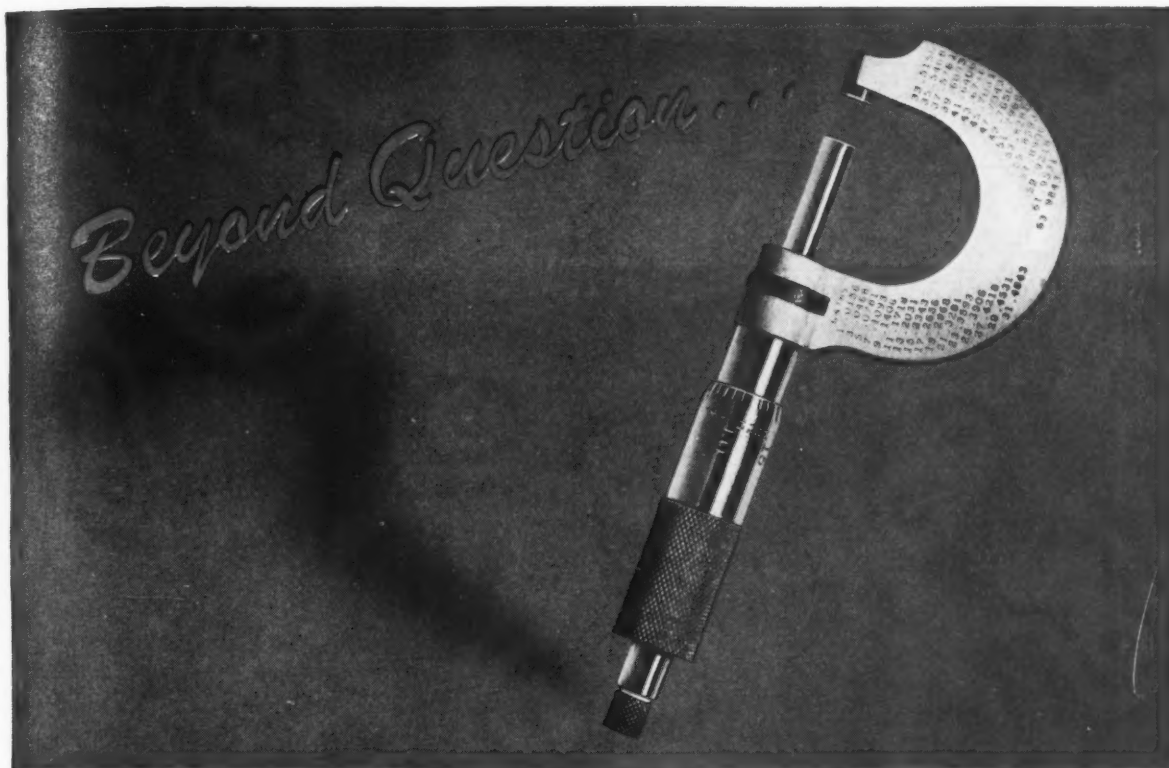
AT LEFT: Explosion-proof boxes and conduit boxes are being flat-surfaced on a No. 124-53" GARDNER Horizontal Disc GRINDER. Production rates average from 100 per hour on the small parts, to 15 - 20 per hour on the large sizes. Tolerances of .002" to .003" for flatness are maintained.

Write for our HORIZONTAL GRINDER Bulletins!

GARDNER - GRIND
YOUR *Flat* SURFACES

GARDNER MACHINE COMPANY

414 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.



When it's a **STARRETT** *"Mike"*



Your machine workers and inspectors take the accuracy of a Starrett "Mike" for granted and what's more, they have no question of your knowledge of tools and your desire to provide them with the finest when you standardize on Starrett Micrometers in every tool crib.

Familiarity with and confidence in the precision tools you provide is an important factor in both the quality and quantity of precision work your shop turns out. That's why it pays to ask your supply house for STARRETT Micrometer Sets.

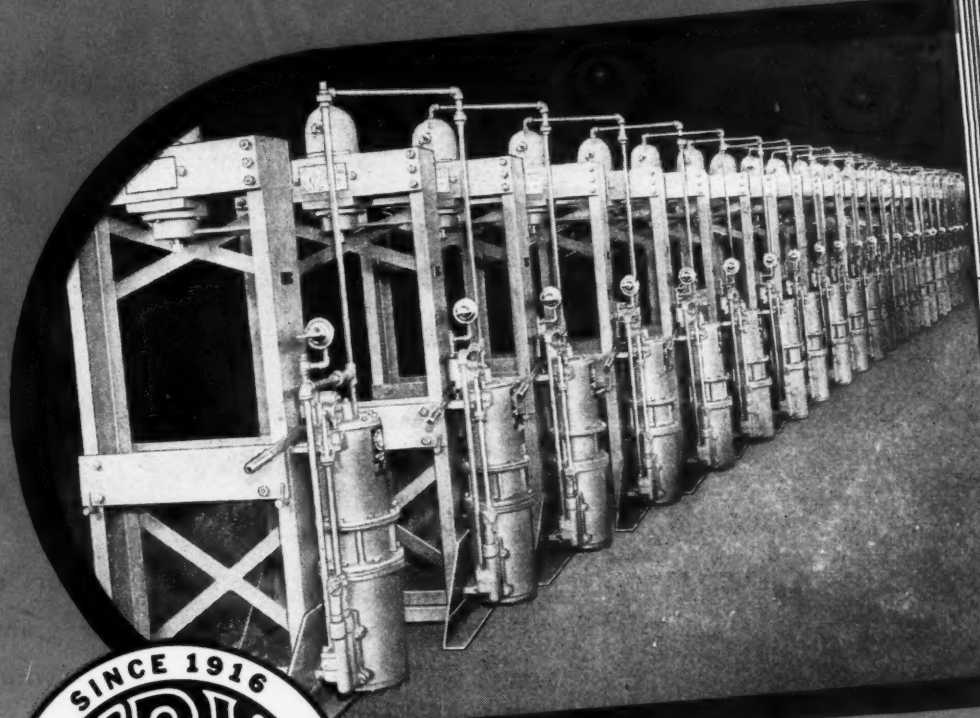
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MOTOR OPERATED

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NEW KRW HYDRAULIC PRESS BOOK *of* PROFITABLE PRODUCTION IDEAS

**NOW AVAILABLE
AS
HAND-OPERATED
ELECTRIC-OPERATED
AIR-OPERATED
*Presses...***

This is more than a catalog... it is a textbook of workable practical suggestions on how low-cost KRW Hydraulic Presses can be adapted to solve a myriad of everyday production operations. 32 completely illustrated pages that show both standard and special KRW Presses in operation. Get your Free Copy now... Mail the coupon at once. K. R. Wilson, 215 Main Street, Buffalo 3, N. Y.

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32-PAGE ILLUSTRATED
HYDRAULIC ARBOR PRESS
CATALOG...**
full of valuable data

K. R. WILSON, 215-217 Main Street, Buffalo 3, N. Y.

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Hydraulic Press Catalog.

Name.....

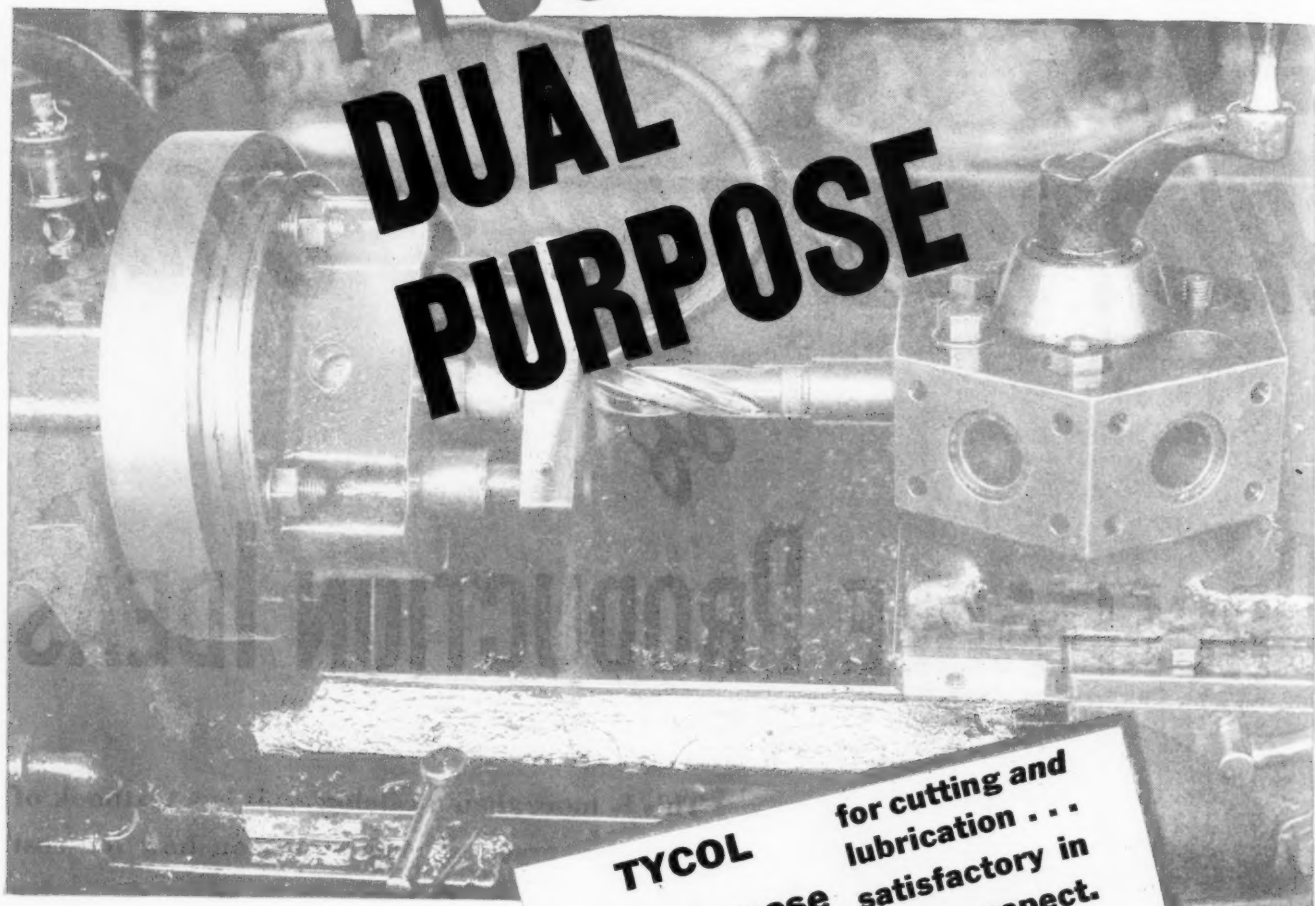
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City & Zone..... State.....

15

TYCOL DUAL PURPOSE

ONE OIL — TWO JOBS
FOR PRODUCTION ECONOMY



TYCOL for cutting and
Dual-Purpose lubrication . . .
OIL satisfactory in
every respect.



Such outstanding results are the rule — not the exception . . . when a Tycol Dual-Purpose Oil is used . . . the one versatile oil that does the work of two oils better and more efficiently. Call, write or wire your nearest Tide Water Associated office for full details.



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OIL COMPANY**

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Montreal

"CUTTING SPEEDS ARE 25% FASTER..."

"AN EXCELLENT MACHINE LUBRICANT..."

"CORROSION IS BANISHED..."

"INCREASED TOOL LIFE..."

"IMPROVED FINISHES..."

TWO SEPARATE OPERATIONS in the time required for rough milling—alone!

NEWTON MILL-N-SHAVER



**Combination Unit Head Milling
and Shaving Machine equipped with
two single vertical milling heads and two
finish shaving heads. Hydraulic feed to table.**

Among Heavy Machine
Tools built by
Consolidated are

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER
SPECIAL MACHINES

The Newton Mill-N-Shaver performs two complete operations at one pass of the table. It rough mills at milling speed and finish shaves on the return, at the rapid traverse speed. This machine produces a perfect gasket surface. Two separate operations in exactly the time ordinarily required for rough milling alone. The Newton Mill-N-Shaver is designed to both step-up your production and reduce your costs on the types of work for which this machine is adapted. For detailed information, write for Bulletin No. 580.

BUILDERS OF HEAVY DUTY MACHINE TOOLS SINCE 1861

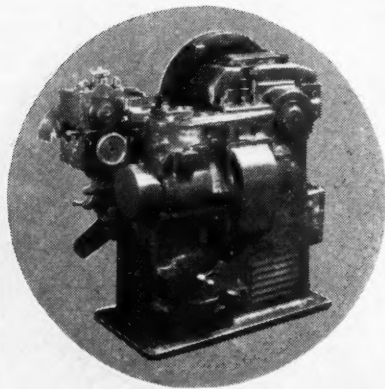
BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN



C O N S O L I D A T E D

M A C H I N E T O O L C O R P O R A T I O N

ROCHESTER 10, NEW YORK



THE COMPANY WHICH IT KEEPS

Although introduced only a few years ago, today's list of National Cold Header users is a "Who's Who" of the bolt and rivet industry.

If you are not among those who are "cashing in" on its wide possibilities, let us present you with the facts.

NATIONAL
MACHINERY COMPANY
TIFFIN, OHIO

New York

Detroit

Chicago

Marvel

Low carbon—high tungsten, for top service at dull red heat. Maintains hardness, resists heat cracks. High toughness—high wear resistance—high heat resistance.

Choice

High carbon—chromium, excellent wear resistance. Specially adapted for compressive forming.

Hotform

The original 5:00% chromium steel in this field—most widely used in hot work on aluminum-base and other alloys. Exceptional strength at elevated temperatures.

Die steels for hot work

Extrude Die

Resists softening at temperatures up to 1300°F. Used for special hot work where extreme toughness is not required.

Hotpress

Low carbon—low chromium—high tungsten. For rod and tube extrusion, general hot pressing. High toughness—high heat resistance—stands water cooling.

Formdie

13.50—14.50% tungsten. Delivers exceptional service on upsetter headers and dies, piercing punches, etc., resisting heat checking and scoring. High strength—high heat resistance.

* One of the series of six Vasco Tool Steel Classifications covering every industrial requirement.

All of the above steels are available in billets, bars, cold drawn shapes, solid forgings, ring forgings, sheet, plate, circles and drill rod.

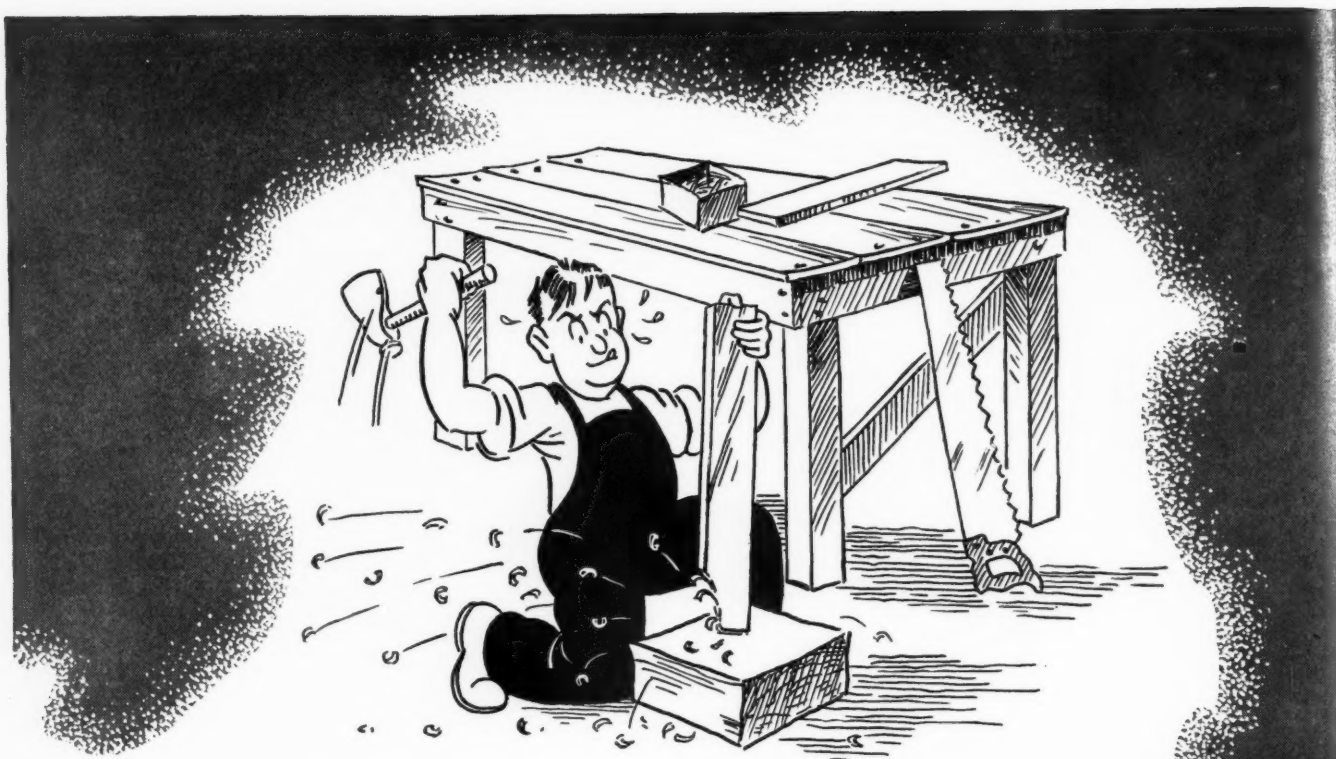
Vanadium-Alloys

STEEL COMPANY

LATROBE, PENNA.

COLONIAL STEEL
DIVISION

ANCHOR DRAWN
STEEL CO.



No More "Hatchet-and-Saw" Workbenches! GET 'EM READY MADE FROM **HALLOWELL**



Fig. 1740
Foreman's Workbench
Pat'd and Pats. Pend.

Why bother with unsatisfactory, bulky "hatchet-and-saw" workbenches of wood, when it's so easy to get just what you want in "Hallowell" benches of Steel. The famous "Hallowell" line offers you workbenches of Steel in over 1300 ready-made combinations . . . sturdily built to withstand long, hard wear. The "Hallowell" benches of Steel can be easily dismantled and reassembled if need be. Try to do this with wooden benches and all that's left is a pile of kindling. And "Hallowell" is the exclusive line that brings you benches in 5 different leg heights, 7 standard lengths. "Hallowell" equipment comprises a variety of other shop and plant necessities, too. Write today for our free "Hallowell" Catalog.



Fig. 732
Pat'd and
Pats. Pend.
Drawer is extra



OVER 40 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 22

BOSTON · CHICAGO · DETROIT · INDIANAPOLIS · ST. LOUIS · SAN FRANCISCO



The Davis Boring Tool Division of Larkin Packer Co., Inc., is now a division of the Giddings & Lewis Machine Tool Company. This union marks a progressive step in modern industrial manufacturing service.

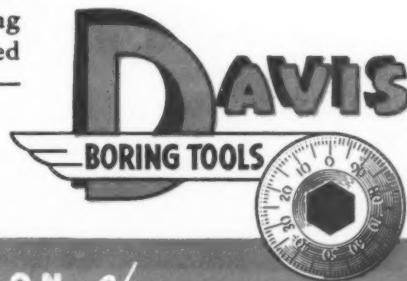
Davis boring tools have for years maintained a high standard of quality and performance on all boring applications. It is fitting that the Giddings & Lewis Machine Tool Company, a pioneer and leader in the machine tool industry, should carry on the progressive work of the Davis engineers. The G. & L. organization will continue the development of boring tools to effectively meet your manufacturing requirements.

Present and future users of standard and special boring tools and equipment will materially benefit from the combined experience of these two major organizations in the metal working field. It is your assurance that modern tools will be developed continuously for your specific needs—the equipment you use—and your individual boring problem.

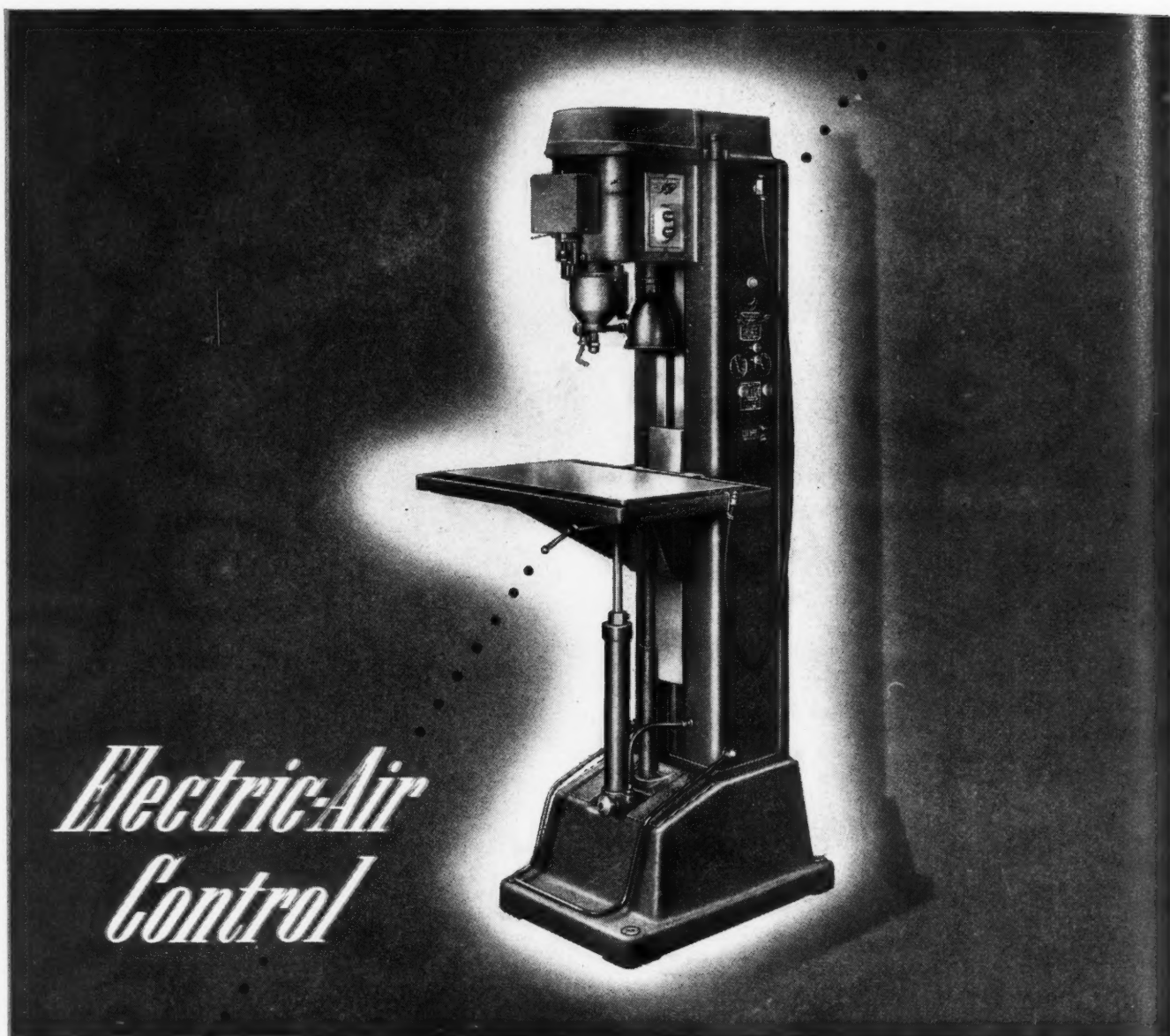


DAVIS BORING TOOL DIVISION of
GIDDINGS & LEWIS MACHINE TOOL CO., FOND DU LAC, WIS., U. S. A.

The Multi-Cutter Boring Tools that produce more at less cost



NOW AVAILABLE..Production Tested...



***haskins* NEW ALL-PURPOSE TAPPING MACHINE**

Electric-Air Control is standard equipment on the new Haskins high speed tapping machines. Completely redesigned, these fully universal machines provide every conceivable method of control and allow free interchange of any type of holding fixture—hand fed or automatic.

Electric-Air increases sensitivity in the application of power, permits accuracy in depth of stroke, satisfies the most exacting requirements. Solenoid valves offer automatic or controlled cycle of operation, allow the synchronizing of holding fixtures with the stroke of the tap head.

All in all, the Haskins Electric-Air Controlled Tapper is certain to become a most important development in modern tapping history. Send for details.

And, in addition, a new heavy duty machine.



R. G. HASKINS CO. • 618 S. California Ave. • CHICAGO 12, ILLINOIS

haskins

**ELECTRIC - AIR CONTROLLED
TAPPING EQUIPMENT**



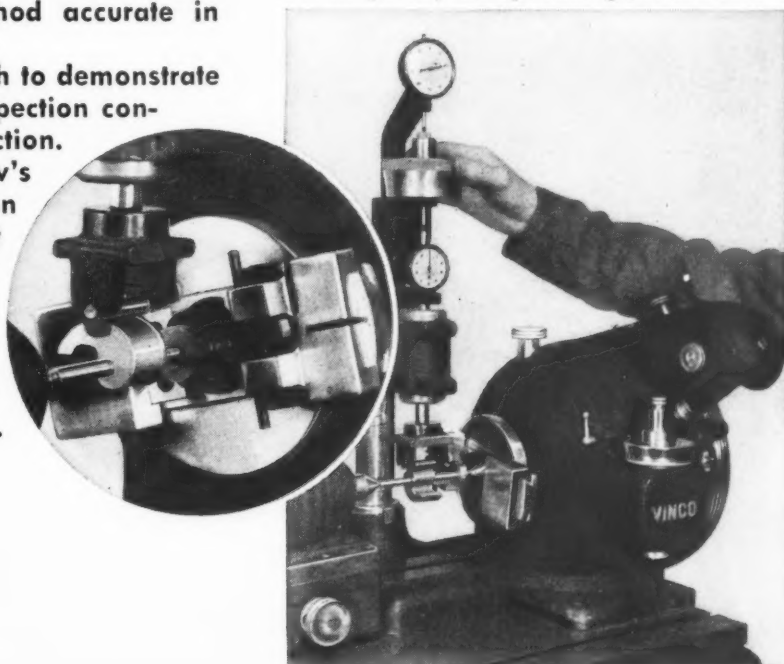
7 hours out of 8

If you use J Blocks and a square to check cam rises. A VINCO Cam Rise Gage with the VINCO Optical Master Inspection Dividing Head accurately checked 68 stations on a precision cam (see next page) in less than one hour; the other method required eight hours. **SEVEN HOURS** saved by the VINCO Cam Rise Gage, and the longer method only proved the VINCO method accurate in every detail.

One instance out of many, but enough to demonstrate the important role a rapid, accurate inspection control has in speeding up precision production. No one can afford to throttle tomorrow's production by slow, obsolete inspection controls. Take an inventory of present inspection equipment and use VINCO's specialized knowledge and skill to aid in this survey. Do this before inadequate and cumbersome checking methods slow production, boost the rejection rate and raise production costs.



Closeup of the VINCO CAM RISE GAGE showing the instrument in position for checking a cam. Note sturdy construction—simplicity of operating principle.



MILLIONTHS OF AN INCH FOR SALE BY VINCO

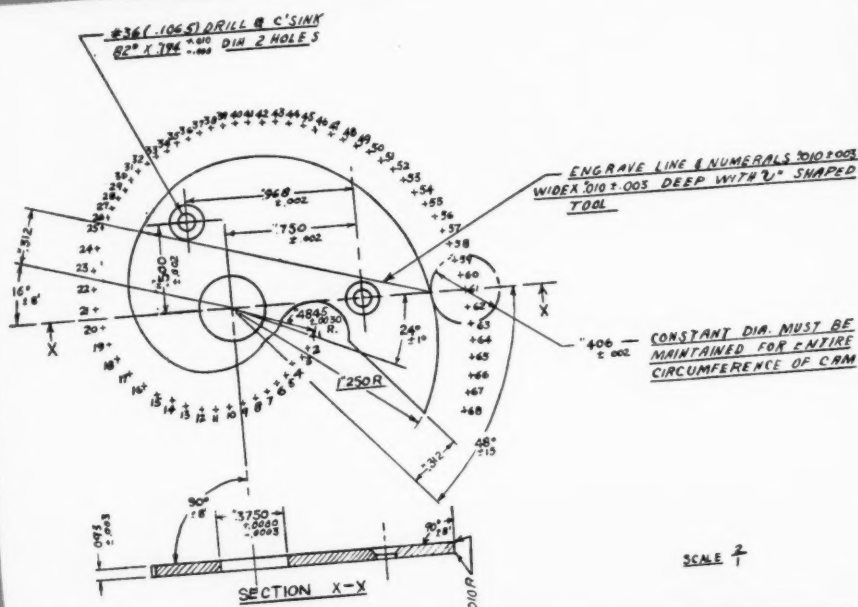
REG. U. S. PAT. OFF.

VINCO CORPORATION, 8853 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Plain Cylindrical Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Shaft and Hub Gages • Built-up and Special Gages • Gear Rolling Inspection Fixtures • Indexing Fixtures • Hydraulic Power Control, Utilization and Distribution Units • Engineering, Design and Development • Precision Production Parts.

They Came to

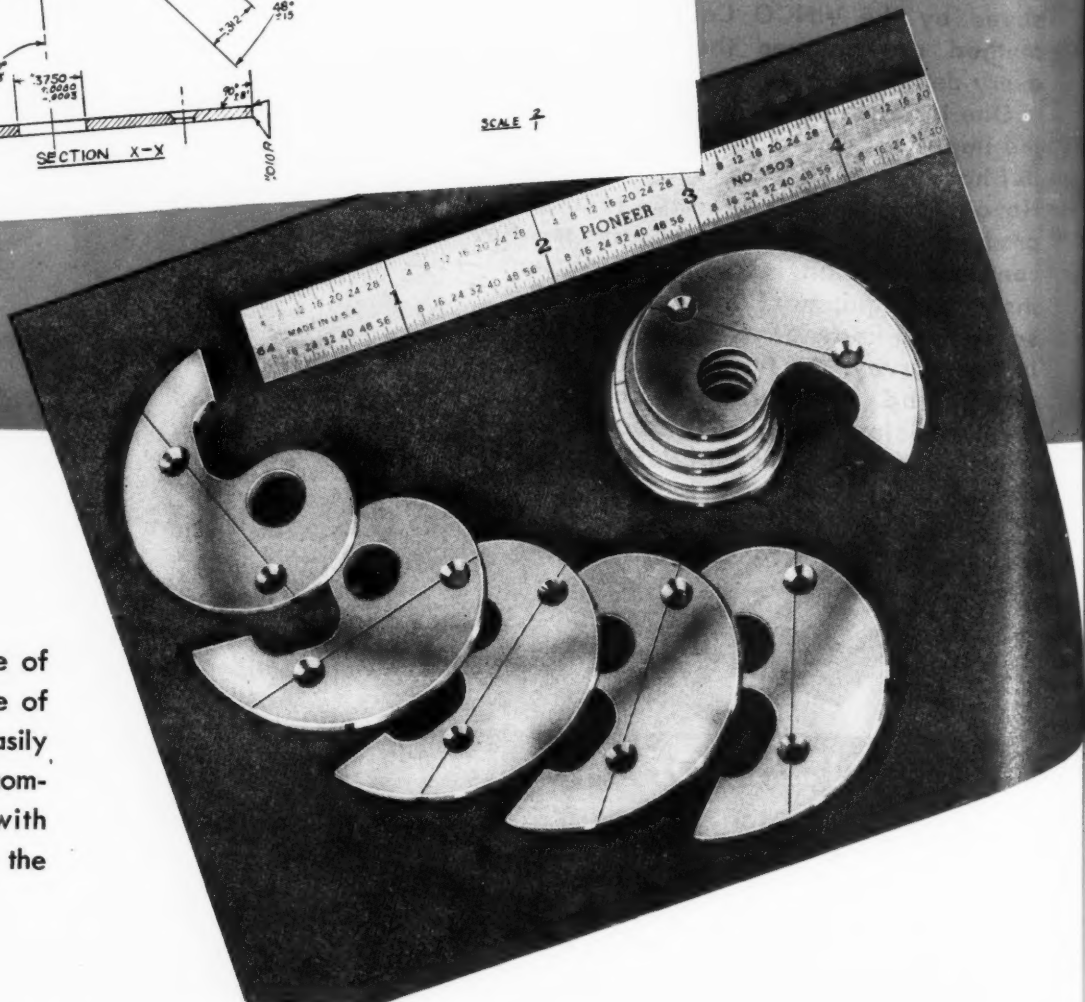
With Problems



SPECIFICATIONS of the cam which was produced and checked at VINCO.

- Relationship on first three stations = .001"
- Relationship on remaining stations = .0005"
- Relationship of holes = .002"
- .4845 radius = .003"

A close estimate of the over-all size of these cams is easily obtained by comparing them with the 6" scale in the photograph.



VINCO

That Had To Be Solved

In this instance it was a request as urgent as it was difficult. These precision cams were needed in quantity and it was necessary that every detail should meet the exacting specifications, for this cam was a vital part of an assembly so delicately balanced, that the slightest deviation in contour and finish would seriously affect the accuracy of the finished instrument.

We were able to produce these parts as specified and on schedule because precision production is our business. We could hint at some closely guarded production secret but, frankly, the only formula used was VINCO engineering knowledge plus VINCO mechanical skill and ingenuity.

Producing precision parts is a highly specialized job and, as many of our leading manufacturers have already discovered, the only economical way to meet this situation is to turn the production of these parts over to VINCO.

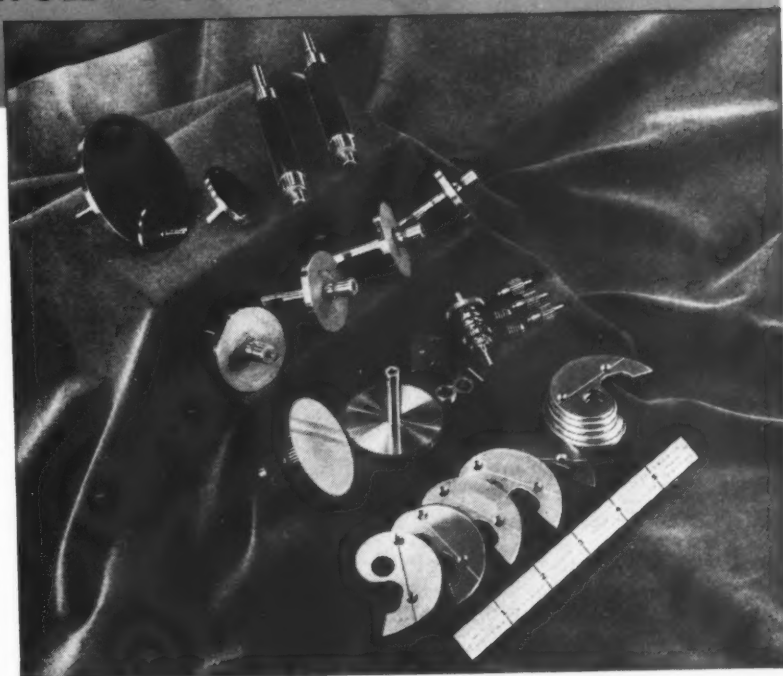
We plan on seeing you at Cleveland A.S.T.E. Convention, April 8-12.

VINCO CORP. DETROIT 27, MICHIGAN
MILLIONTHS OF AN INCH FOR SALE

Investigate this Important Vinco Service—Precision Production of Small Parts

No one is better equipped to produce precision parts on a production basis than VINCO.

Modern machinery, highly specialized engineering knowledge, and craftsmen thoroughly schooled on close limit operations, all combine to produce these parts on schedule, in desired quantity and exactly as specified. Investigate this sure way to lower production costs. Call your VINCO Sales Engineer or see us personally for more detailed information.



YEARS OF "KNOW-HOW" GIVE YOU

Proven Design and Extra Life

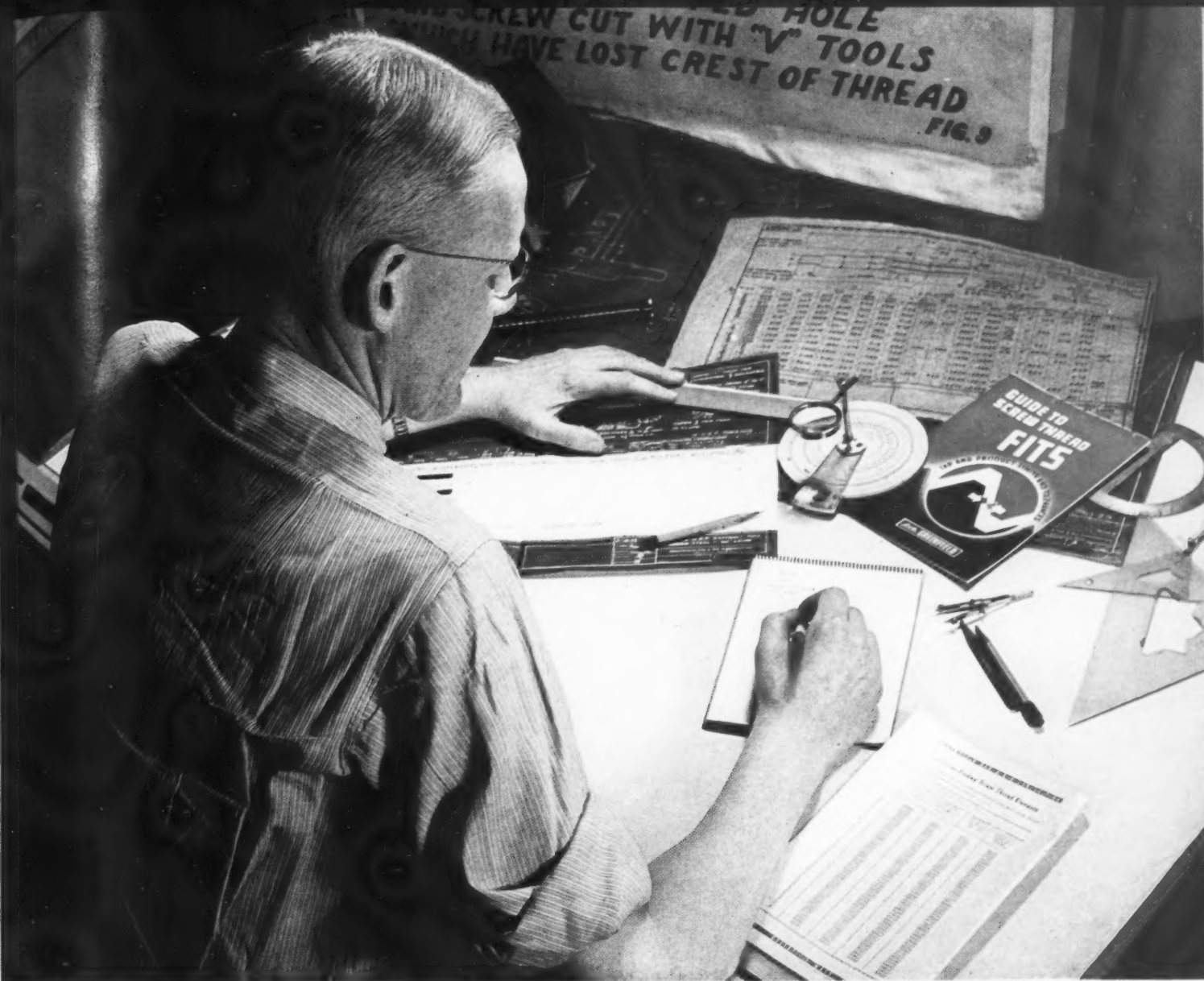


As the pioneer producer of Tungsten Carbide Gages, Taft-Peirce years ago recognized the economies *for you* which are inherent in the application of these super-hard, long-wearing materials to gage construction. And Taft-Peirce has built carbide gages ever since—thousands of them—of every conceivable variety. Why not use this background of experience as your source of supply? It will increase the quality of your own product, give you standards on which you can depend. Write for the new Taft-Peirce Handbook, just off the press. In it you can find a gage for every purpose.

TAFT-PEIRCE GAGES
Standards on which you can depend



The TAFT-PEIRCE MANUFACTURING CO.
WOONSOCKET, RHODE ISLAND



REPRODUCED FROM AN ORIGINAL KODAK

Your Threading GHQ

When the man in charge of "operations" runs into a new problem, he usually looks to "General Headquarters" for help.

So in threading operations on all industrial fronts, the man with a problem is able to go to the engineering department of the Greenfield Tap and Die Corporation for expert help. "Greenfield" engineers can focus on any problem the cumulative "know-how" of years of pioneering leadership in screw thread research.

Not only does "Greenfield's" threading "GHQ" help solve specific day-to-day problems for users of threading tools, but it also carries on an intensive continuing program of research that benefits all users. *If you have a threading problem, get in touch with "Greenfield" screw thread engineers through your "Greenfield" distributor.*



GREENFIELD

GREENFIELD TAP and DIE CORPORATION
GREENFIELD, MASSACHUSETTS

Behind Every GREENFIELD Product..

LARGEST MANUFACTURING CAPACITY



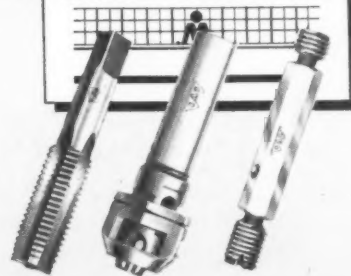
ENGINEERING AND RESEARCH



FIELD SERVICE MEN



LEADING DISTRIBUTORS



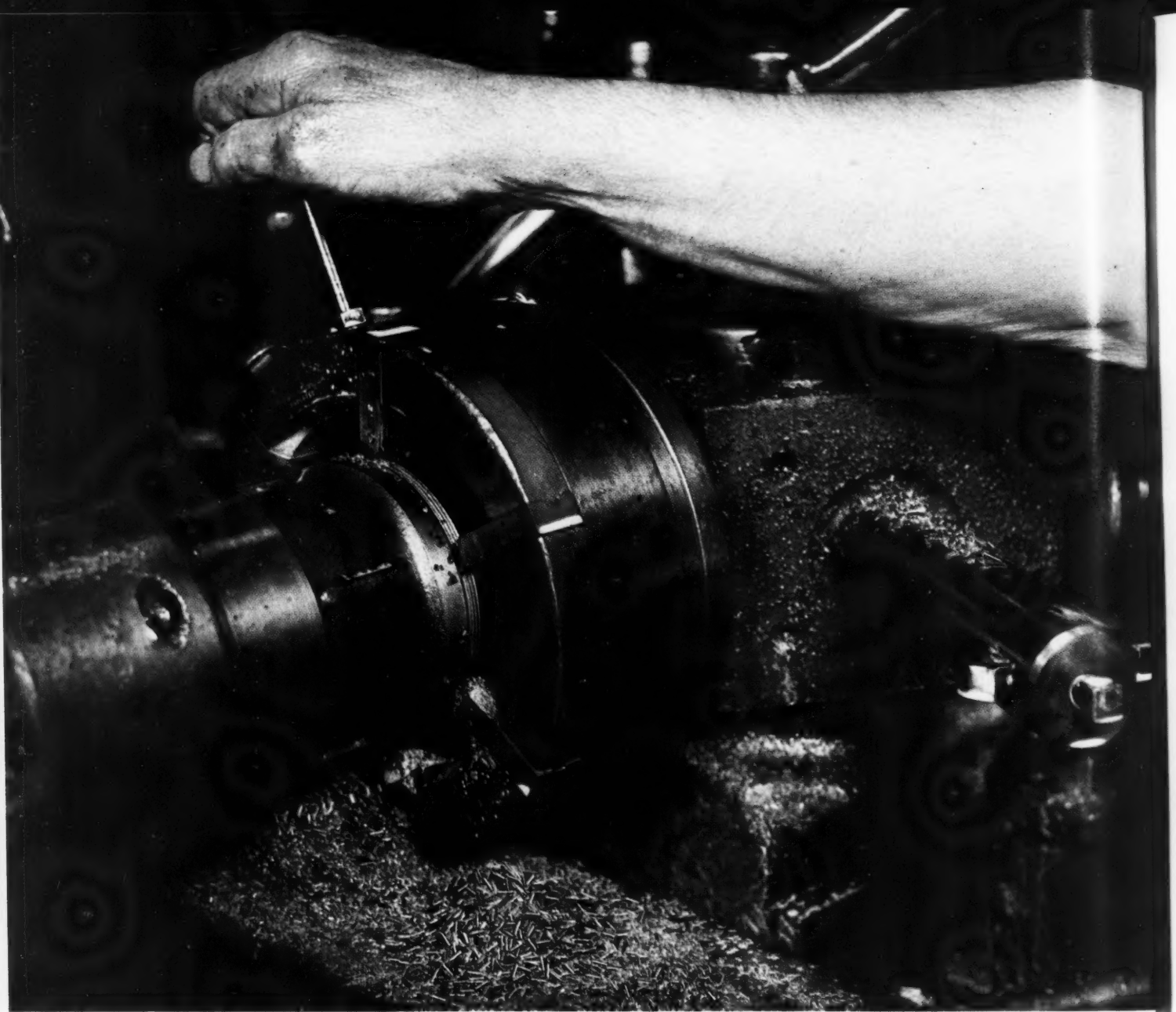
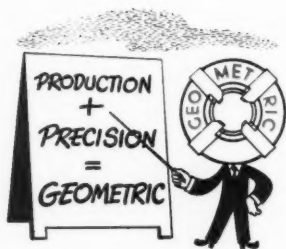


PHOTO COURTESY MANNING, MAXWELL and MCORE, INC., BRIDGEPORT, CT.

Production plus precision . . . that's **GEOMETRIC!**



Threading the base of a safety valve is the kind of job that a Geometric Self-Opening Die Head (Style C) does with efficiency day in and day out. No fussing. No

babying. When the machine operator tools up with a Geometric he knows he'll get clean, accurate threads. He knows, too, that he'll get production. That's why Geometric Self-Opening Die Heads and Collapsing Taps are known and respected in leading metal-working plants the world over for their simplicity, ruggedness and accuracy.

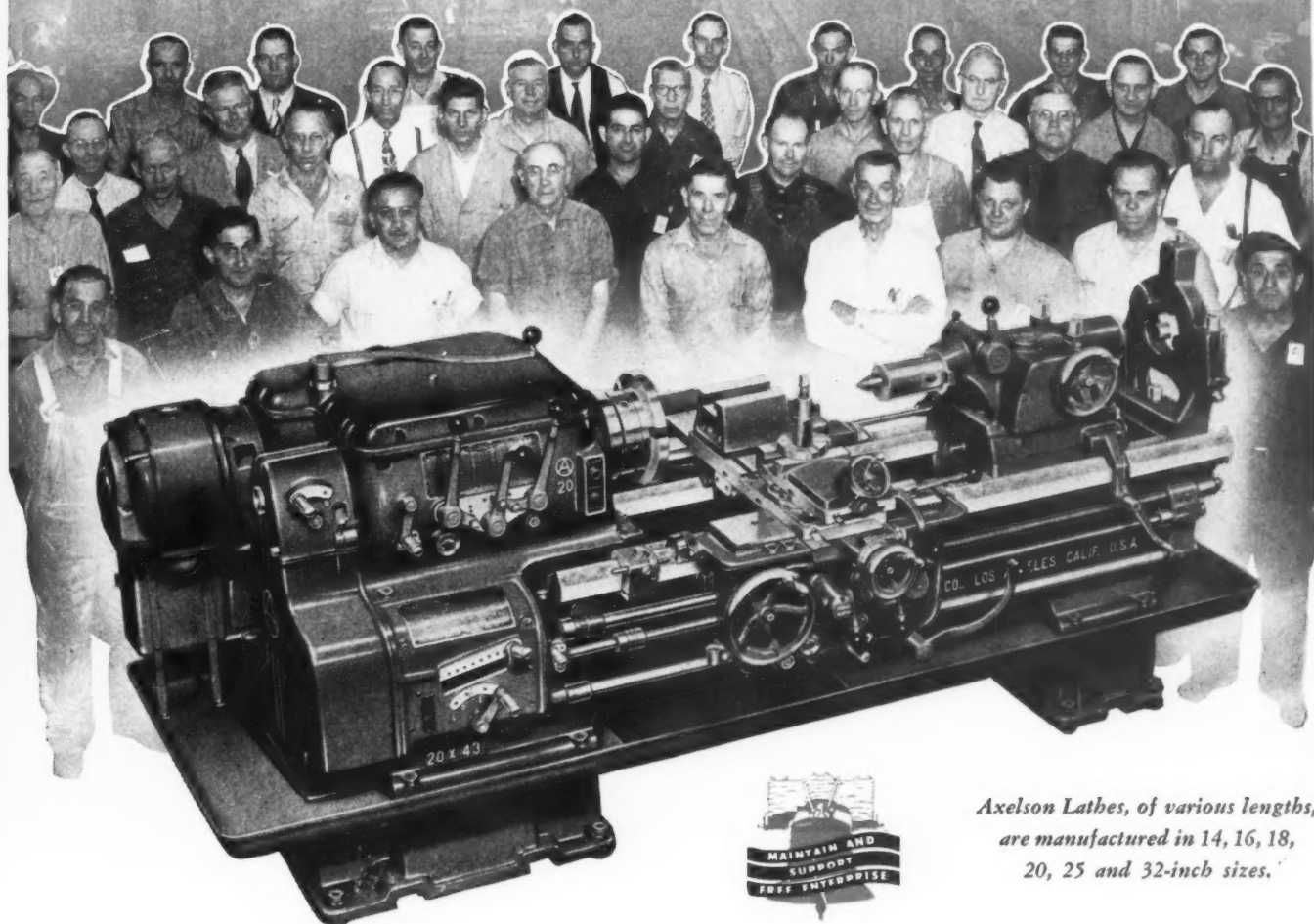
FOR NEARLY EVERY THREADING JOB — A GEOMETRIC!

If you have in mind a particular threading problem, we will be glad to have our engineers give you their recommendations, based on over a half century of specialization in this field. Why not let us send you the latest Geometric catalog?

**THE
GEOMETRIC**
TOOL COMPANY . . NEW HAVEN 15, CONN.
*A Division of Greenfield Tap and
Die Corporation*

800 YEARS

OF LATHE BUILDING EXPERIENCE



Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

Behind every reputable machine tool stands a group of engineers and artisans responsible for the reputation it enjoys... The above group of 37 Axelson employees was taken recently at the plant... Pictured are men from the "front office", engineering department, foundry, machine shops and assembly division... And these are only some of the Axelson veterans... men who have grown up proudly with

the great Axelson heavy duty Lathe... The continuous service-range of men in the picture is between 17 and 33 years with Axelson, and the total represents more than 800 years of Lathe building experience... That's 800 years of the know-how that has created the beauty, versatility, speed, precision and economy of operation built into the Axelson Lathe in more than thirty years of manufacturing... The result is best summed up in the words of the Axelson motto: "There is no Economical Substitute for Quality."

AXELSON LATHES

*Dependable for over
a Quarter Century*

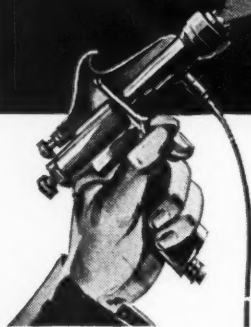


AXELSON MANUFACTURING CO.
6160 S. Boyle Ave. (Box 98, Vernon Station), Los Angeles 11,
Calif. • 50 Church St., New York City 7 • 3844 Walsh St.,
St. Louis 16, Mo.



NU-SPEDE FINISHES

**HIGH QUALITY AT
LOW PRODUCTION COST**



Remarkable Lowe Brothers Finish Fills Many Finishing Requirements

Adaptable to a wide variety of finishing needs and methods, Lowe Brothers Nu-Spede is an exceptionally attractive high gloss, weather resisting finish for wood or metal.

Lowe Brothers Nu-Spede, being available in quality to meet different application and drying specifications, meets the finishing requirements of a great number of products. Trucks, vehicles, transport farm equipment, lawn furniture, mail boxes, playground and welding equipment, and many other products will take on new sales appeal with Nu-Spede.

Noted for its ease of application, Nu-Spede can be either sprayed or brushed. It flows out evenly and smoothly. It air-dries, dustfree, in 15 minutes—hard overnight. Nu-Spede can be baked in from 30 minutes at 200° to 1 hour at 140°.

Furthermore, Nu-Spede can be applied over Nu-Spede Primer, *after only 5 minutes of air-drying.* This

Lowe Brothers application method eliminates between-coat baking and greatly steps up production while lowering the cost of quality finishing. For information about Nu-Spede's application to your product, write, without obligation, to

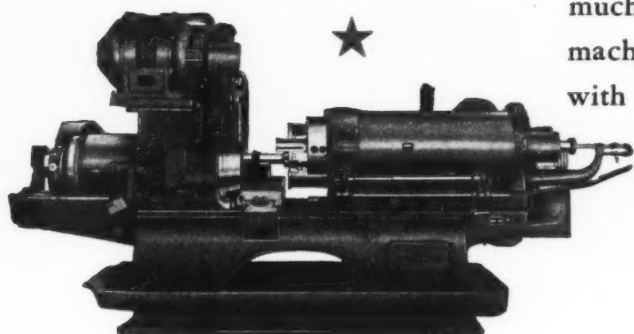
**INDUSTRIAL SALES
THE LOWE BROTHERS COMPANY
DAYTON, OHIO**

***Lowe Brothers*
FINISHES for Industry**

IS YOUR INFORMATION UP-TO-DATE ON AUTOMATIC PRODUCTION?



The First CLEVELAND
AUTOMATIC—1888



Today's CLEVELAND MODEL A 5 1/4"

If you have never had a clear explanation of the cost cutting advantages of the exclusive universal camming feature of Cleveland Automatics, you do not have the full picture of the great advances made in automatic production since we made the first industrially practical machine in 1888. Set-up on a Cleveland Automatic is much faster than usually credited to fully automatic machines. Combined with the high rate of production with multiple tooling, this means cost savings over other types of machine production ON SHORT RUNS AS WELL AS MASS PRODUCTION. Let us give you the down-to-earth proof of Cleveland Automatic cost cutting...

Get this Bulletin

describing the wide range of Cleveland Automatic capacities, from 9/16" to 10 1/2" bar and tube stock. Other bulletins available include one describing Cleveland High-Pressure Hydraulic Die-Casting Machines.



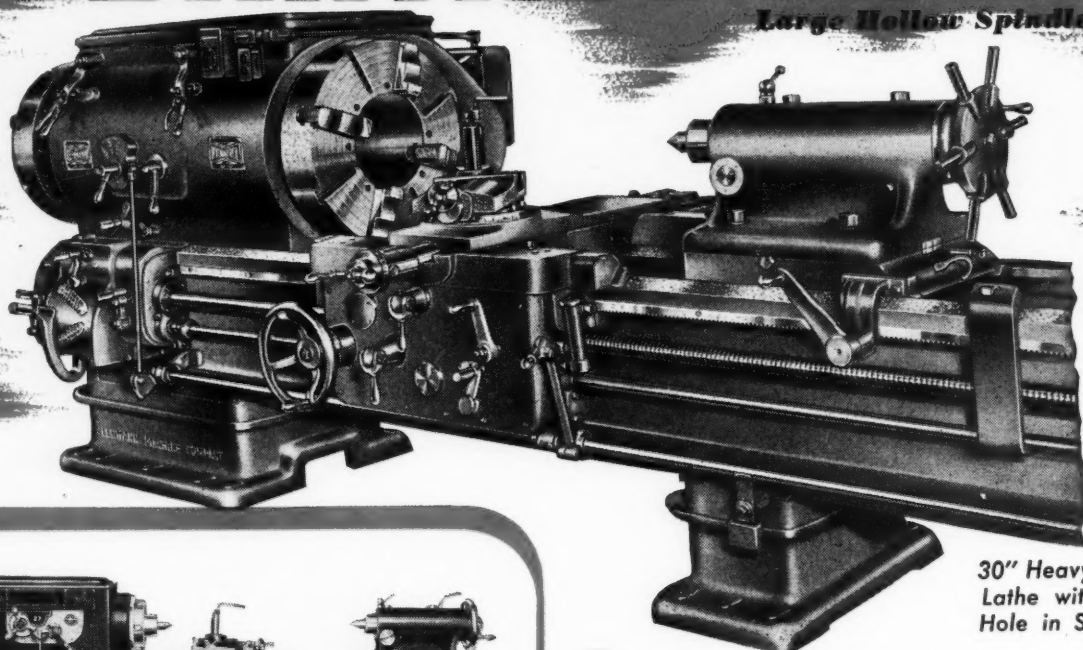
CHICAGO (6):
1408B Civic Opera Building
DETROIT (2):
540B New Center Building
NEW YORK (6):
1806 Singer Building
CINCINNATI (12):
4932B Beach Street
HARTFORD (1):
529B Capital National Bank Bldg.



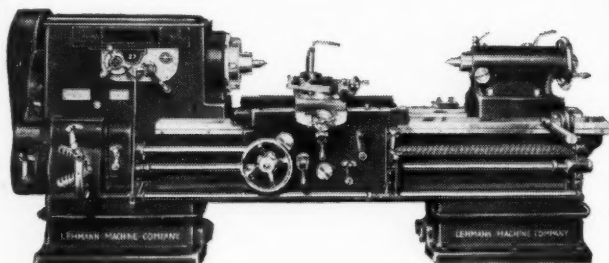
THE CLEVELAND AUTOMATIC MACHINE CO.

Do it Better!... on a **HYDRATROL LATHE**

Large Hollow Spindle Type



30" Heavy Duty
Lathe with 13"
Hole in Spindle



Standard Type, Heavy Duty HYDRATROL LATHES, 20" to 36"

The big 27" size, shown above, has all the ruggedness and power for the heaviest possible work. And its many refinements in design and construction result in an ease of operation comparable to small machines.

In hundreds of plants—under all sorts of conditions—LEHMANN HYDRATROL LATHES have invariably brought about faster production, better work, lower costs.

Look around your own shop—you may find a number of machining jobs which possibly could be done better on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these unusual, difficult, or too-costly machining jobs, for a specific, time-and-money-saving recommendation.

Five Sizes - 18" to 36"

Small	18" up to 7 1/4" Hole
Medium	24" up to 12" Hole
Large	27" up to 13" Hole
Large	30" up to 14" Hole
Large	36" up to 16 1/2" Hole

(Standard type lathes, 16" to 36")

***Lehmann* MACHINE COMPANY**

CHOUTEAU AT GRAND . . . ST. LOUIS 3, MISSOURI

"PICCOLO PETE"



THE INSPECTOR



THIS Sheffield Precisionaire which reminded the purchaser of a piccolo, checks a tapered bore at ten points. Inside the spindle a plunger type valve directs the air flow through one pair of diametrically opposed orifices at a time, thus making it possible to check each of the ten points in sequence.

The tolerance markers on the base instrument are set to the maximum and minimum master chambers (illustrated). In inspecting the work part the spindle is inserted into the bore and each of the ten points checked progressively. If the indicator remains within the length of tube between the markers throughout the inspection, the part is acceptable. If not, any error is immediately located.

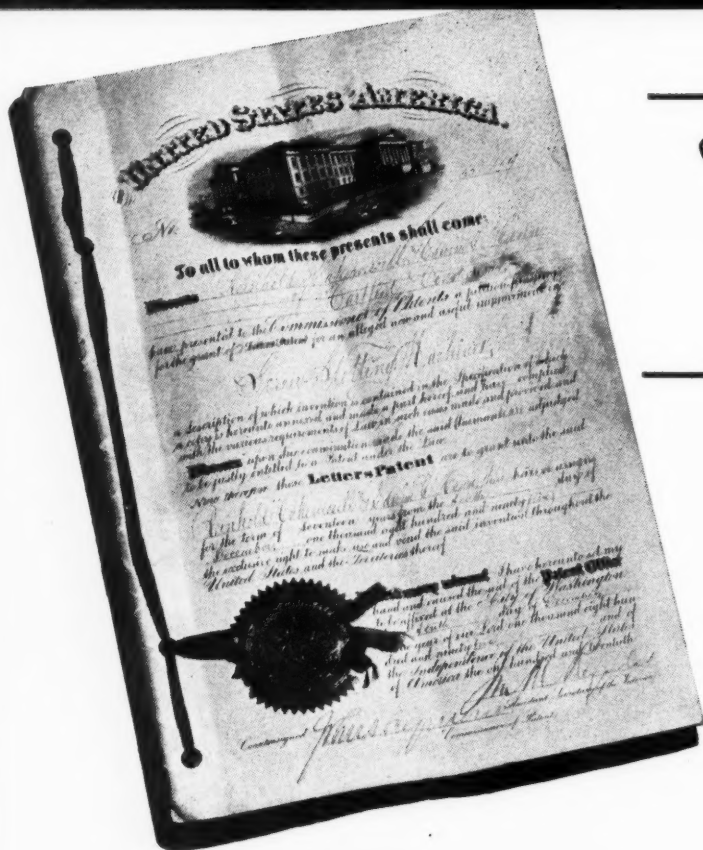
check
WITH
SHEFFIELD

on rapid precision inspection by air of both internal and external dimensions — our local representative will gladly demonstrate a Precisionaire in your plant.

The SHEFFIELD CORPORATION

Dayton 4, Ohio, U.S.A.

MACHINE TOOLS • GAGES • MEASURING INSTRUMENTS • CONTRACT SERVICES



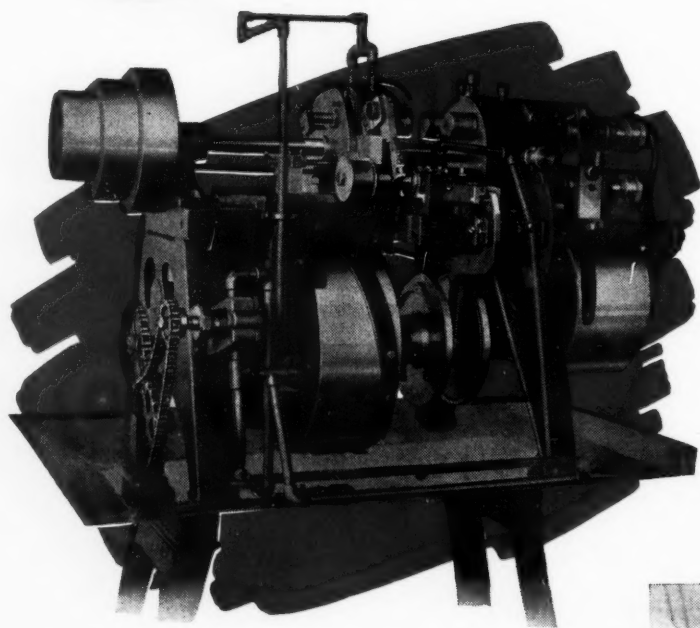
"To all to whom t

Fifty years ago, the Patent Office of the United States issued to Edwin C. Henn, founder of The National Acme Company, and to Reinhold Hakewessell the first patent ever to be granted covering a multiple-spindle automatic screw machine.

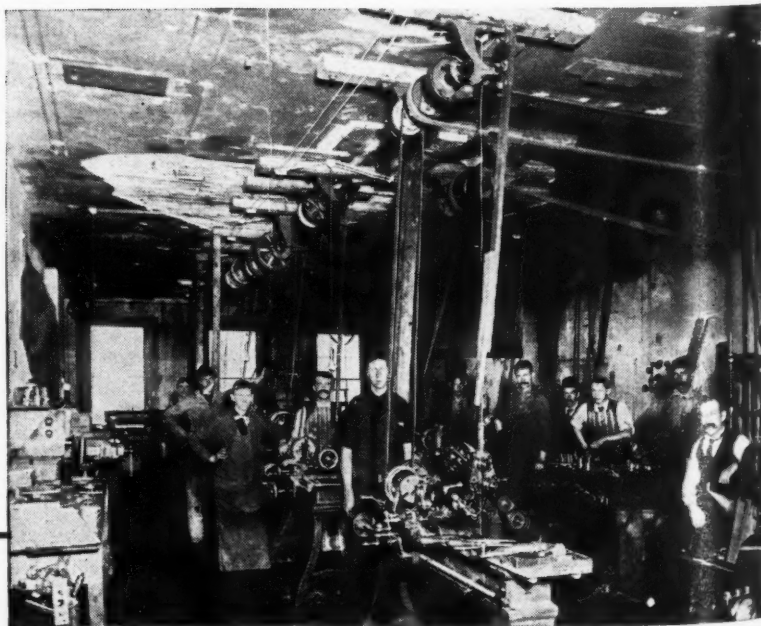
Perhaps it can be said that this was the real beginning of American mass production methods—the first multiple to produce, automatically, identical parts in large quantities.

From this start has grown our nation's ability to turn out vast numbers of automobiles, radios, refrigerators, typewriters, instruments and hundreds of other mechanical aids to working and living—at such low costs that they are within the buying reach of millions, both here and abroad.

Here is the shop at Hartford, Conn. in which the first Automatic was produced, and the men who built that machine.



This "4-Spindle Acme Automatic" is the first machine produced by National Acme—number one of a series of continuously improved models now totaling more than 40,000.



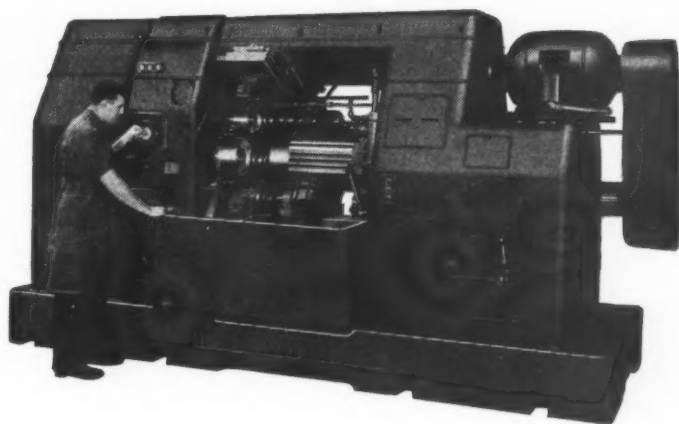
these presents shall come:

National Acme enters its 51st year of serving industry with an extensive line of 1, 4, 6 and 8-Spindle Acme-Gridley Automatics—both Bar and Chucking types.

Every engineering refinement in these machines is geared to their original purpose—to reduce the cost of producing identical precision metal parts—from the smallest up to 12" diameter.

Many of America's largest manufacturing industries depend upon National Acme leadership in Automatics for their ability to create the mechanical marvels without which our wars could not be won, nor our modern standards of living achieved.

Our engineers will be glad to show you the advantages of these modern multiples in terms of guaranteed speeds, finish and lower production costs.

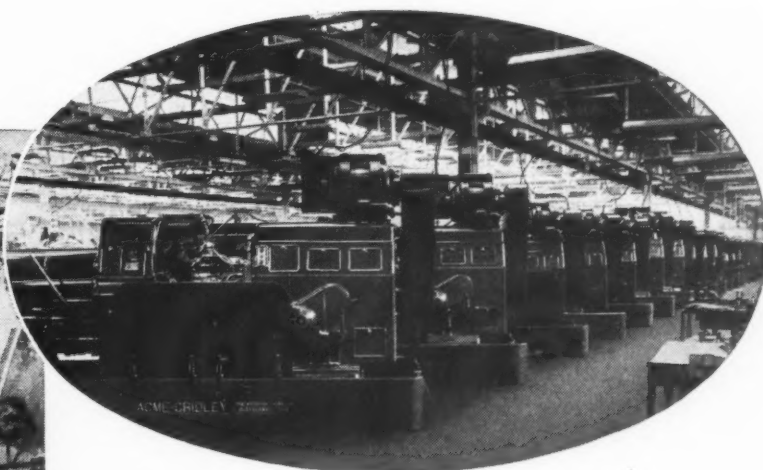


Modern Six Spindle Acme-Gridley Chucking Automatic—Capacity, 12". Weight, 30 tons.

A typical production plant, equipped with Acme-Gridley Multiple-Spindle Automatic Machines.



The National Acme Plant at Cleveland—12½ acres of floor space—equipped and staffed for progressive engineering and precision manufacturing.



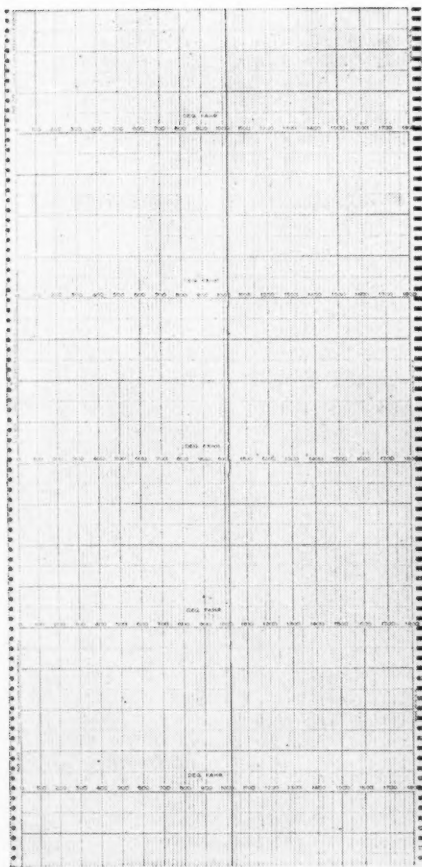
The NATIONAL
ACME COMPANY

170 EAST 131st STREET • CLEVELAND 8, OHIO

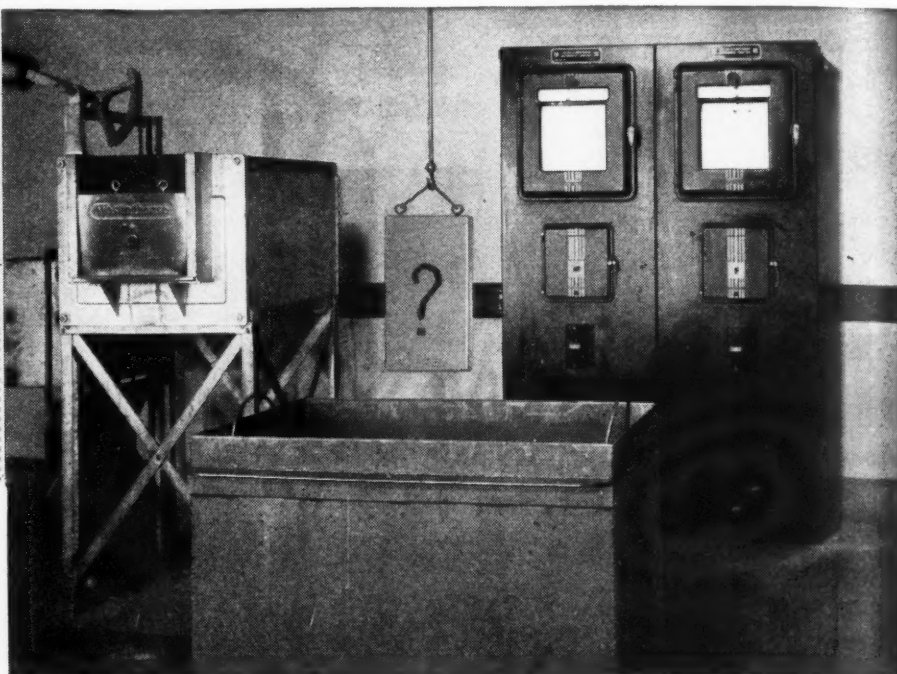
ACME-GRIDLEY BAR AND CHUCKING AUTOMATICS: 1-4-6 AND 8 SPINDLE • HYDRAULIC THREAD ROLLING MACHINES
AUTOMATIC THREADING DIES AND TAPS • THE CHRONOLOG
LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES
SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

Here's **PRECISE** Control for **ELECTRIC** *Furnaces*

(It's Called Micromax Duration-Adjusting Type)



The straightness of the temperature-control record shown above is significant for 2 reasons: (1) the furnace pictured at right works under a frequently-changing load, and (2) any inaccuracies tending to result are efficiently counteracted by the Micromax D.A.T. Controller's automatic droop corrector.



When engineers in Heppenstall Co. laboratories were looking for a better way to operate electrically-heated furnaces, they heard of a control system that was increasingly coming into successful use. Not only did it regulate electric input to hold temperature at a selected control point or to a program, but it held it there so dependably as to make possible an efficient balance among product uniformity, speed of output, flexibility of operation.

Heppenstall's installation of this system (called Micromax Electric Control, Duration-Adjusting Type) has had excellent results. They find that it brings as responsive a control action as the Position-Adjusting Type of M.E.C. has long brought to fuel-fired furnaces. As the name implies, energy input is regulated by automatic control of the time current is "off" and "on." Automatic droop-correction refines the regulating; Overshoot Control assures safety when the furnace is brought up to temperature under full power input.

The D.A.T. system can be applied successfully to processes which run the gamut from small laboratory furnaces to large production units. For further information, request Catalog N-00A (2). Or an L&N engineer will gladly supply specific data.



LEEDS & NORTHRUP COMPANY, 4921 STENTON AVE., PHILA. 44, PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS • TELEMETERS • AUTOMATIC CONTROLS • HEAT-TREATING FURNACES

Jrl. Ad N-00A(7d)

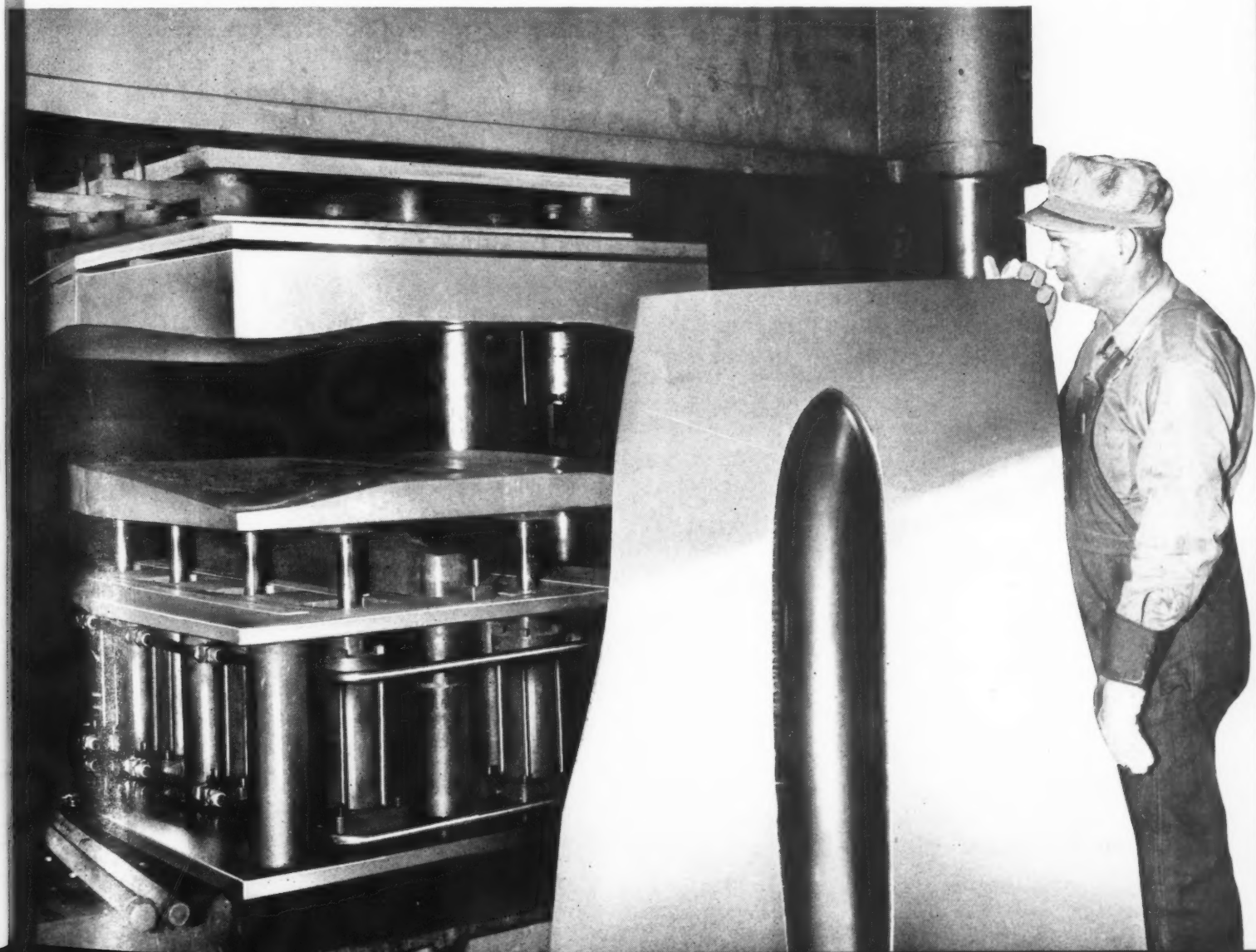
DEEP-DRAWING OF MAGNESIUM

By RALPH G. GILLESPIE, Engineer
Brooks & Perkins, Detroit, Mich.

KNOWLEDGE obtained during war days concerning the desirable characteristics of magnesium alloys is leading to wide adoption of these alloys in the manufacture of post-war products. In the past, magnesium has been used primarily in the field of aviation, where lightness of weight is imperative, as, for example, in the construction of airborne equipment, such as radar and other instruments, and for certain applications on plane structures themselves. Now magnesium alloys are being considered for almost every type of portable equipment—typewriters, adding machines,

lawn mowers, sewing machines, milk bottle crates, and a large variety of household appliances.

Magnesium alloys are particularly suited to such applications because of the fact that they are approximately one-third lighter than aluminum. There is, however, at least one other characteristic of sheet magnesium alloys which adapts them to many applications, and that is their deep-drawing properties at elevated temperatures. Alloys of magnesium, for example, can be drawn from three to four times as deep in one operation as steel or aluminum. This property enables parts to be made



DEEP-DRAWING OF MAGNESIUM

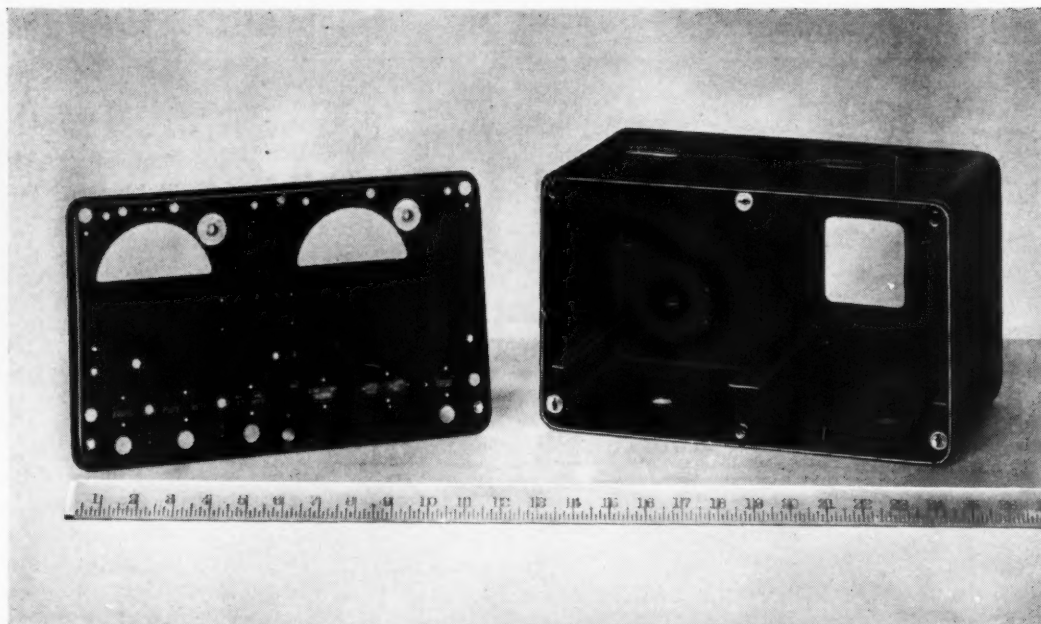


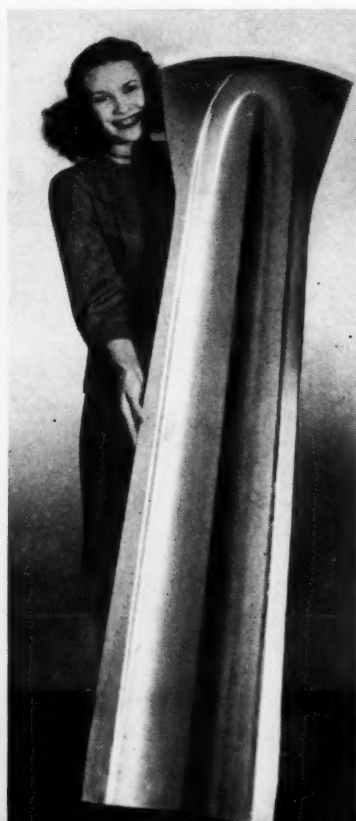
Fig. 1. Magnesium Radar Computer Housing, 12 1/4 Inches Long by 7 Inches Wide, which is Drawn to a Depth of 8 Inches in One Operation

in one piece that, if made of other metals, would often have to be fabricated by welding or riveting three or four pieces together. One-operation deep-drawing, therefore, makes possible more pleasing product designs. The large saving in time also

compensates for the somewhat higher first cost of magnesium-alloy sheets.

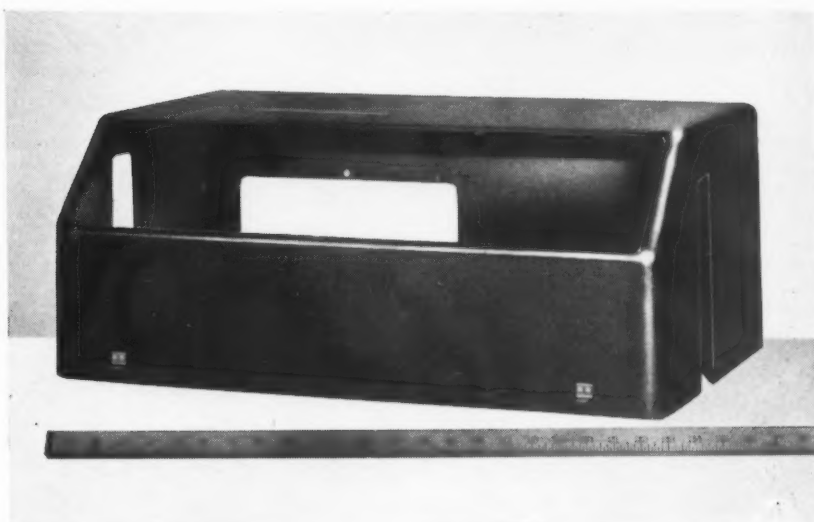
Generally speaking, magnesium-alloy parts can be drawn to a depth of from one and one-half to two times the minimum width of the part in one

Fig. 2. (Left) Magnesium-alloy Container, 28 1/2 Inches Long by 10 3/4 Inches Wide Inside, which is Drawn to a Depth of 12 Inches. Fig. 3. (Center) Dorsal Fin Drawn to a Depth of 8 Inches with a Fillet of Only 1/8 Inch Radius at the Bottom of the Drawn Crease. Fig. 4. (Right) Airplane Gun Fairing in the Untrimmed, Drawn Condition at the Right, and in the Completely Fabricated Condition at the Left



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Fig. 5. Another Radar Computer Housing, 26 Inches in Length by 16 1/8 Inches in Width, which is Drawn to a Depth of 11 Inches in One Operation



operation. In the case of products drawn from a circular blank, the depth of draw in one operation can equal twice the diameter of the drawn part. Within reasonable limits, the thicker the sheet, the better the draw and the more easily it is formed. However, it is entirely practical to draw deep parts from very thin sheets, as will be apparent from Fig. 1, which shows, at the right, a radar computer housing, 12 1/4 inches long by 7 inches wide by 8 inches deep. This housing was drawn from magnesium-alloy sheet only 0.081 inch thick. The fillets around the bottom of the housing are of 11/64 inch radius, while the corners at the sides are rounded to a radius of 1/2 inch. This is an

example of the minimum radii that have been used in drawing operations on magnesium, but the ultimate limit has probably not yet been reached.

The radar housing was constructed with narrow strips of magnesium alloy around the top edges to provide a support for the cover, seen at the left. The latter was also drawn from magnesium alloy. The various holes were pierced in a press operation subsequent to drawing. Before this housing was deep-drawn from magnesium, it was constructed of several pieces of aluminum, welded together. The magnesium product has a far more pleasing appearance and is more simply manufactured.

Another radar computer housing, 26 inches long

Fig. 6. Box Type Gas-fired Furnace Used for Heating Quantities of Magnesium-alloy Sheets at One Time preliminary to Drawing on a Large Hydraulic Press



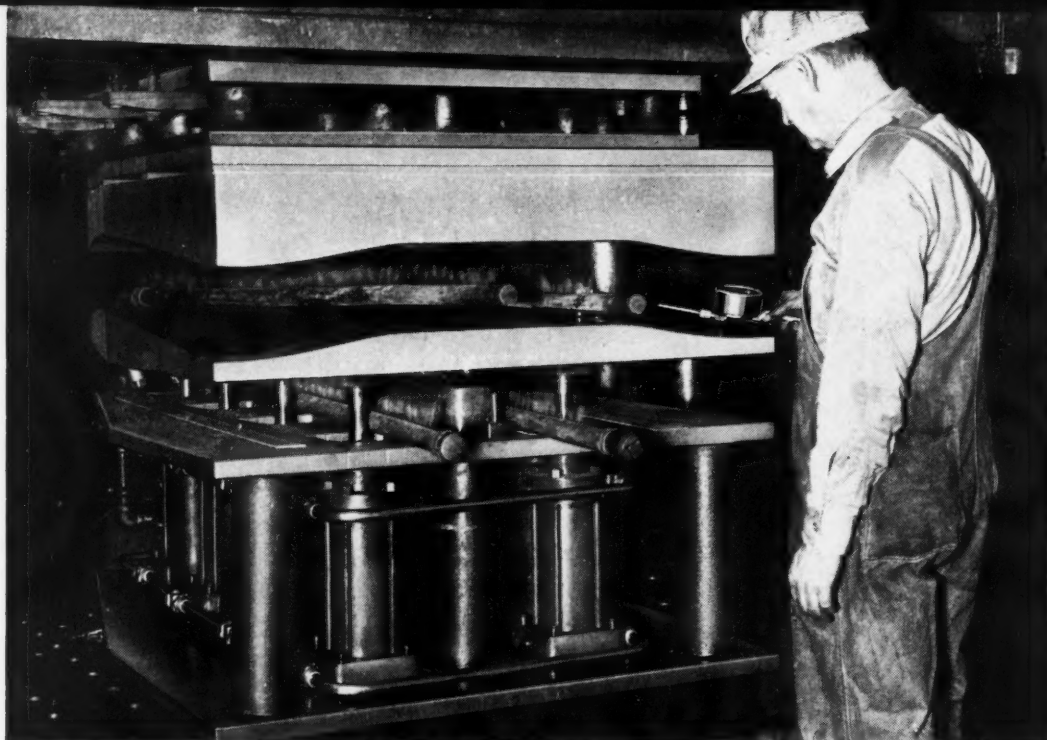


Fig. 7. Magnesium-alloy Drawing Dies must be Preheated to About the Same Temperature as the Work Blanks which, with the Die Set Shown, is 600 Degrees F.

by 16 1/8 inches wide, by 11 inches deep is shown in Fig. 5. This box was drawn from sheet 0.064 inch thick. It was made with a 45-degree inclined surface, the bottom of which is at a vertical distance of 5 1/2 inches from the top edge. The holes were blanked out after drawing. Various other sizes and types of boxes have been produced for radar applications. All of them were provided with a baked black crackle finish. Magnesium parts are especially suitable for finishes of various kinds, including phenol formaldehyde and urea formaldehyde plastics.

One of the best deep-drawing jobs in the plant of Brooks & Perkins, where all photographs here shown were taken, is the large rocket box held by the girl in Fig. 2. As taken from the press, the inside dimensions of this box are 12 inches deep, 28 1/2 inches long, and 10 3/4 inches wide. Magnesium-alloy sheet 0.081 inch thick is used for this

box. Attention is called to the reinforcing depressions along the bottom, ends, and sides of the part. They are formed at the same time that the work is being drawn. The flange is trimmed from the top of the box prior to use.

Dorsal fins for Republic P-47 Thunderbolts have been drawn from Dow FS-1 magnesium alloy to the shape seen in Fig. 3, and then trimmed to the required outline. The trimmed fins are approximately 61 inches long by 11 inches wide. The depth of the drawn depression varies from 6 inches at the closed end to 8 inches at the open end. There is a fillet of 1/8 inch radius at the bottom of the drawn crease. The material used in drawing these dorsal fins is only 0.040 inch thick. The lightness of the large stamping will be apparent from the fact that the girl is holding it off the floor with little effort.

Wing gun fairings for Bell King Cobras were

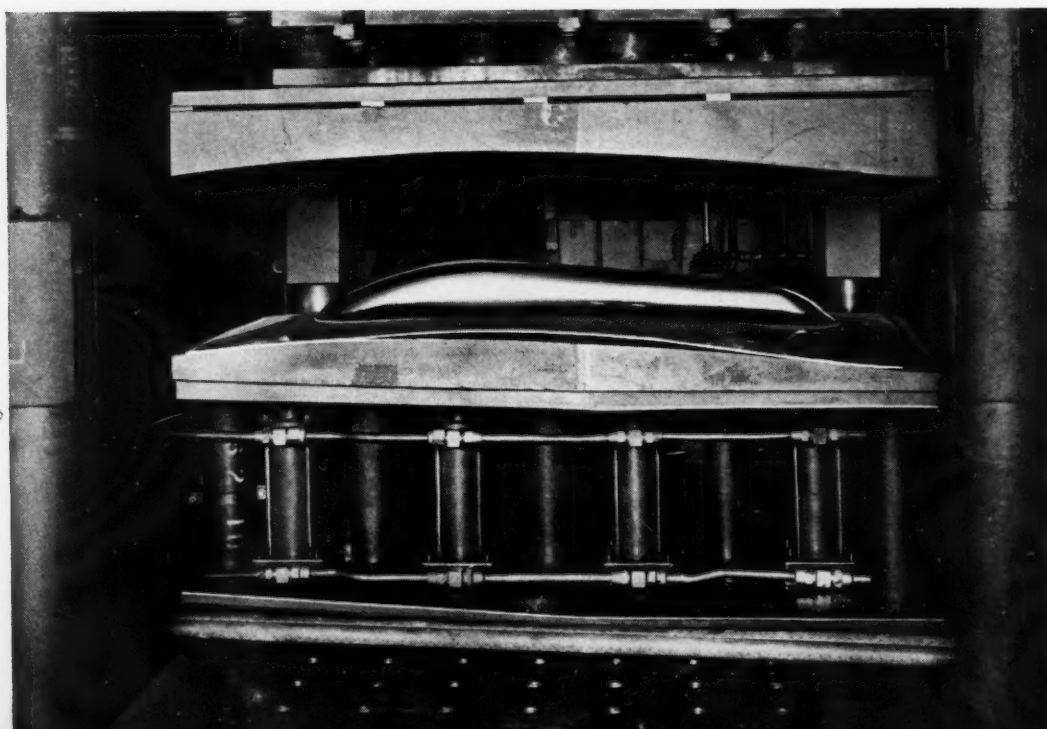


Fig. 8. Die in Fig. 7 with the Draw-ring at the Bottom, in the Position Occupied at the End of an Operation, and the Upper Die Member Raised

Fig. 9. Die Set Employed in a 75-ton Hydraulic Press for the Shallow Drawing of Cooking Grills from Magnesium-alloy Sheets 5/32 Inch in Thickness



made from Dow Ma magnesium alloy 0.064 inch thick. Fig. 4 shows the grill holding at the right one of these stampings as it comes from the drawing press with its flange untrimmed, and at the left, a fabricated fairing ready for installation on a plane. The finished part is 35 inches long, has a maximum width of 10 inches, and is formed to a depth of 9 inches. The fillets between the flange and the side walls of the untrimmed part are of 3/8 inch radius.

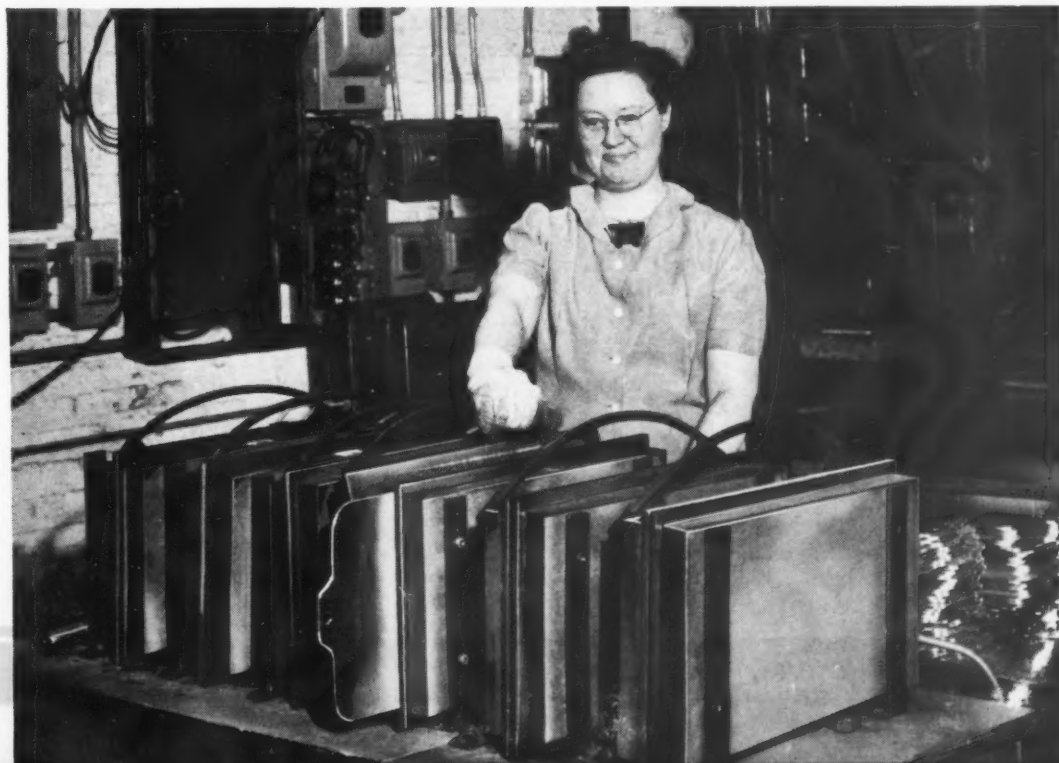
Drawing of magnesium alloys is performed with the sheets and dies hot. The preferable work temperature varies with the type and depth of draw, thickness of material, radius of the various corners, and certain other factors. If the product must be stiff and of comparatively high strength, using sheet magnesium in the hard condition, too high a preheat should not be specified, because this may result in annealing of the metal and a reduc-

tion in its strength. The maximum temperature to which magnesium-alloy sheets should be heated for drawing is approximately 650 degrees F., and the minimum temperature about 300 degrees F. When low temperatures are employed, there will be considerable spring-back in the stampings. This is likely to be an important factor whenever the work is brought to the press at a temperature of less than 450 degrees F.

The different coefficients of expansion for magnesium and steel must be carefully considered in designing dies for each job, and suitable compensation made for the difference. As a matter of fact, considerable experimentation is required with each new job, and satisfactory results are generally contingent upon practical knowledge.

The gas-fired box type furnace used in heating the sheets is shown in Fig. 6. Normally, several sheets are placed in the furnace at a time. They

Fig. 10. Battery of Electric Heaters Employed for Heating the Magnesium Blanks for Grills preparatory to Performing the Drawing Operation



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remain in the furnace fifteen minutes or longer when a stack of sheets is being heated. When only one or two sheets are placed in the furnace, 1 1/4 minutes is usually sufficient time to bring them up to the required temperature.

Most of the deep-drawing on the magnesium-alloy sheets is performed on a 750-ton Williams & White hydraulic press, which is seen in the heading illustration. The press is shown equipped with dies for producing doors for the main landing gears of airplanes. Incidentally, the stamping is trimmed with a wide, irregular flange to a maximum width of 41 inches. The depression is 4 1/2 inches deep by 56 inches long. The landing gear doors are produced from material 0.100 inch thick, and constitute a comparatively simple job with magnesium sheets.

Dies of the size shown are preheated to a temperature of 600 degrees F. by means of gas flames rising from pipes on top of the draw-ring and on the die base, as seen in Fig. 7. The pipes are 1 1/4 inches in diameter, and are provided with two rows of No. 40 holes spaced to 3/4-inch center distances, with rows 3/4 inch apart. It takes about

four hours to heat this die set to the working temperature. The operator is seen checking the temperature of the draw-ring with a pyrometer. The pipes are, of course, removed from between the die members prior to starting a series of drawing operations.

In operation, the magnesium sheet is gripped between the draw-ring and the die member attached to the ram and then pulled down over the punch, which is mounted on the die base. The draw-ring is supported by the pistons of eight hydraulic cylinders, which serve to hold the draw-ring and magnesium sheet firmly against the ram die member until the bottom of the draw-ring comes into contact with the die base, as shown in Fig. 8. The illustration shows the finished stamping lying on the punch and draw-ring after the ram has been raised at the end of the operation. Large sheets of magnesium are sprayed with a suspension of colloidal graphite in lactol spirits before being placed in the furnace, and the die surfaces that come in contact with the blank are wiped with a mixture of graphite and tallow in order to facilitate the drawing of the sheet.

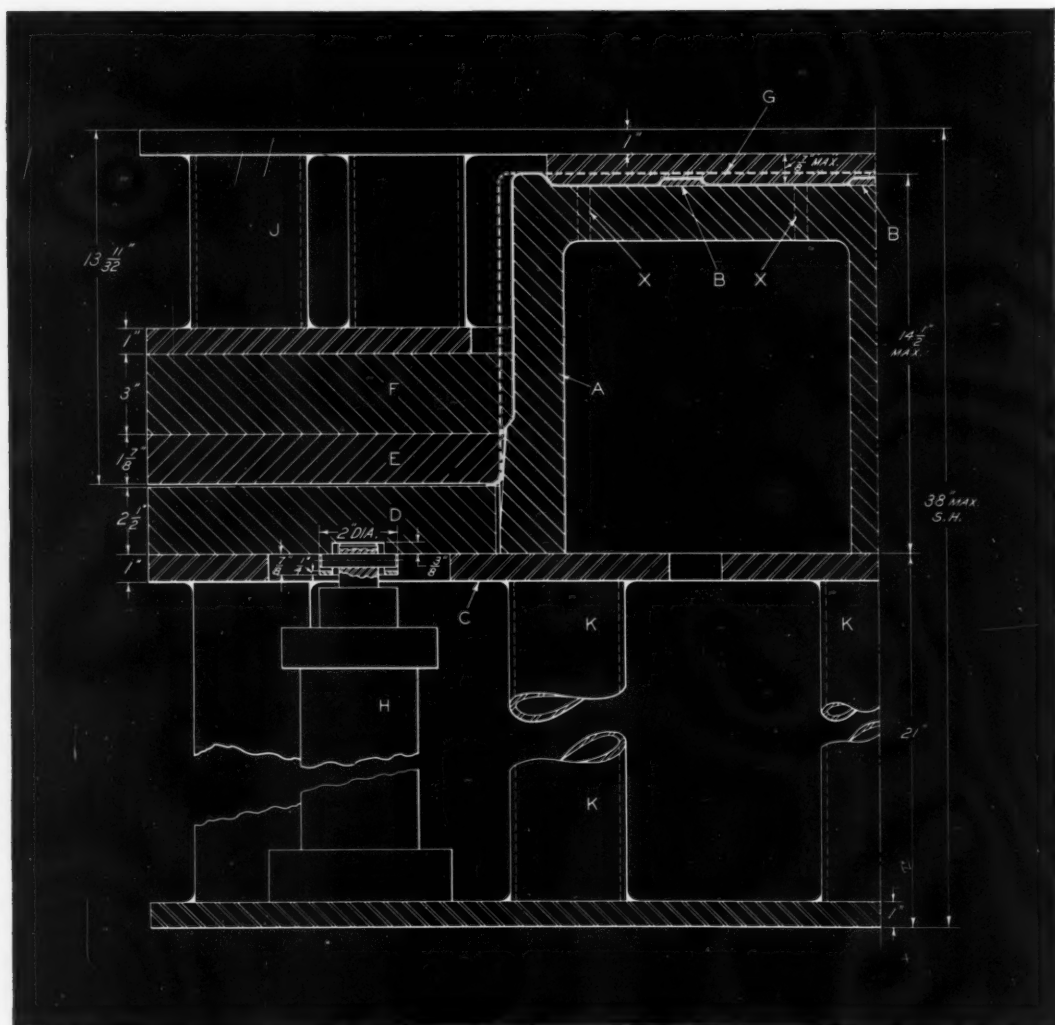
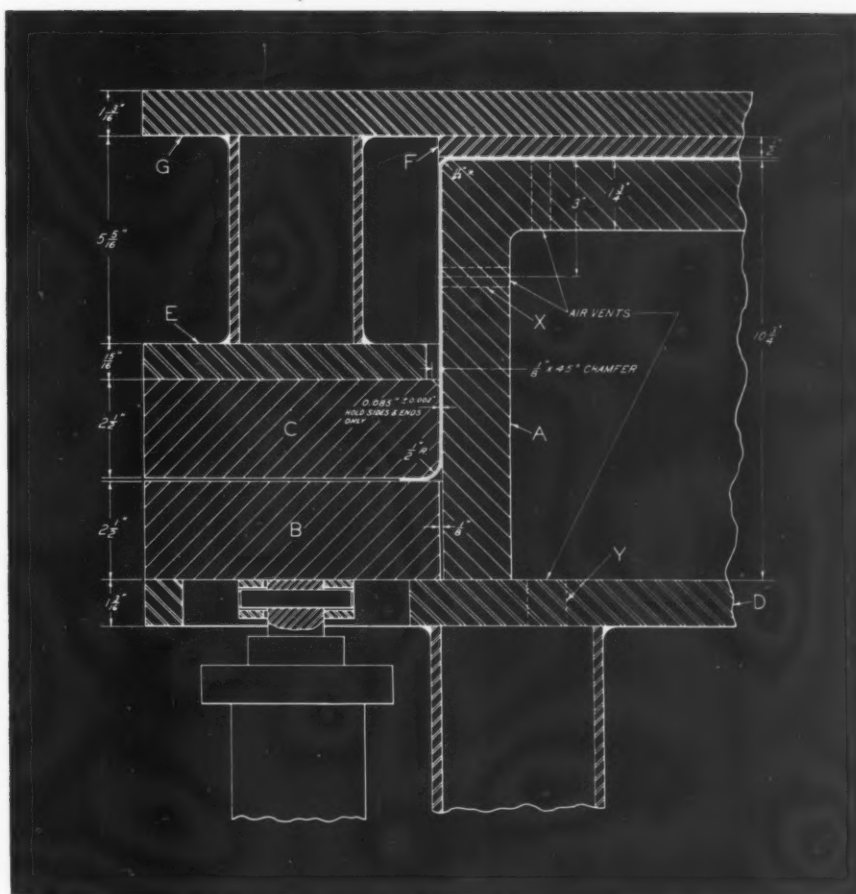


Fig. 11. Cross-sectional Drawing of the Die Set Employed to Produce the Large Magnesium-alloy Container Held by the Girl in Fig. 2

Fig. 12. Comparatively Simple Dies Suffice for Producing the Thin-gage Radar Housings. The Die Here Shown Produces the Radar Housing Illustrated in Fig. 1



Shallow drawing operations on medium-sized magnesium sheets are performed on the smaller 75-ton hydraulic press illustrated in Fig. 9, which is designed with a hydraulically actuated table that rises to draw the magnesium blank against the stationary upper die member or punch. The press is shown equipped with a die set for drawing grills from sheets 5/32 inch thick. The grills measure 12 by 18 inches, and are drawn to a depth of 3/8 inch. Four grills are produced per minute.

The dies are heated constantly by electric strip heaters, and also by gas pipes until they have attained the required temperature. The magnesium blanks are heated in electric plate heaters of the design shown in Fig. 10, which are provided with a hinged plate on one side that permits convenient loading and removal. The blanks attain the required working temperature of 500 degrees F. after approximately one minute in the electric plate heaters. They are carefully cleaned with carbon tetrachloride before being placed in the electric heaters to prevent dust from the blanks becoming loaded on the die surfaces, and to remove any oil from a previous routing operation.

Design details of the dies used to produce some of the magnesium stampings are illustrated in Figs. 11, 12, 13, and 16. Fig. 11 shows a cross-sectional drawing of the dies used to produce the

rocket container illustrated in Fig. 2. An outline of the stamping at the end of the operation is indicated by the heavy colored line, the die being shown in the closed position.

The punch, which is an iron casting, is indicated at *A*. It is provided on top with steel inserts *B* for forming the depressions in the bottom of the container. The punch is attached to the steel die plate *C* which is supported on tubular columns *K*.

Air vents X are provided on the punch to prevent compression of air within the work, which would cause the walls of the stamping to buckle. The escape of air also facilitates stripping of the work from the punch, the sides and ends of which are made straight, that is, without draft.

The draw-pad *D* is supported on hydraulic cylinder cushions *H*. The sections of the upper die-ring which form the sides and ends of the container are shown at *E* and *F*. The draw-pad and the die-ring are iron castings. The upper die-ring is also provided with a steel section *G* for forming the depressions in the bottom of the rocket box. Attention is called to the sections of 4-inch pipe at *J* and *K* employed in the construction of the upper die-ring and the die base, respectively. These pipe lengths permit an open construction, which greatly reduces the transfer of heat from the working surfaces of the die and the work to the press ram

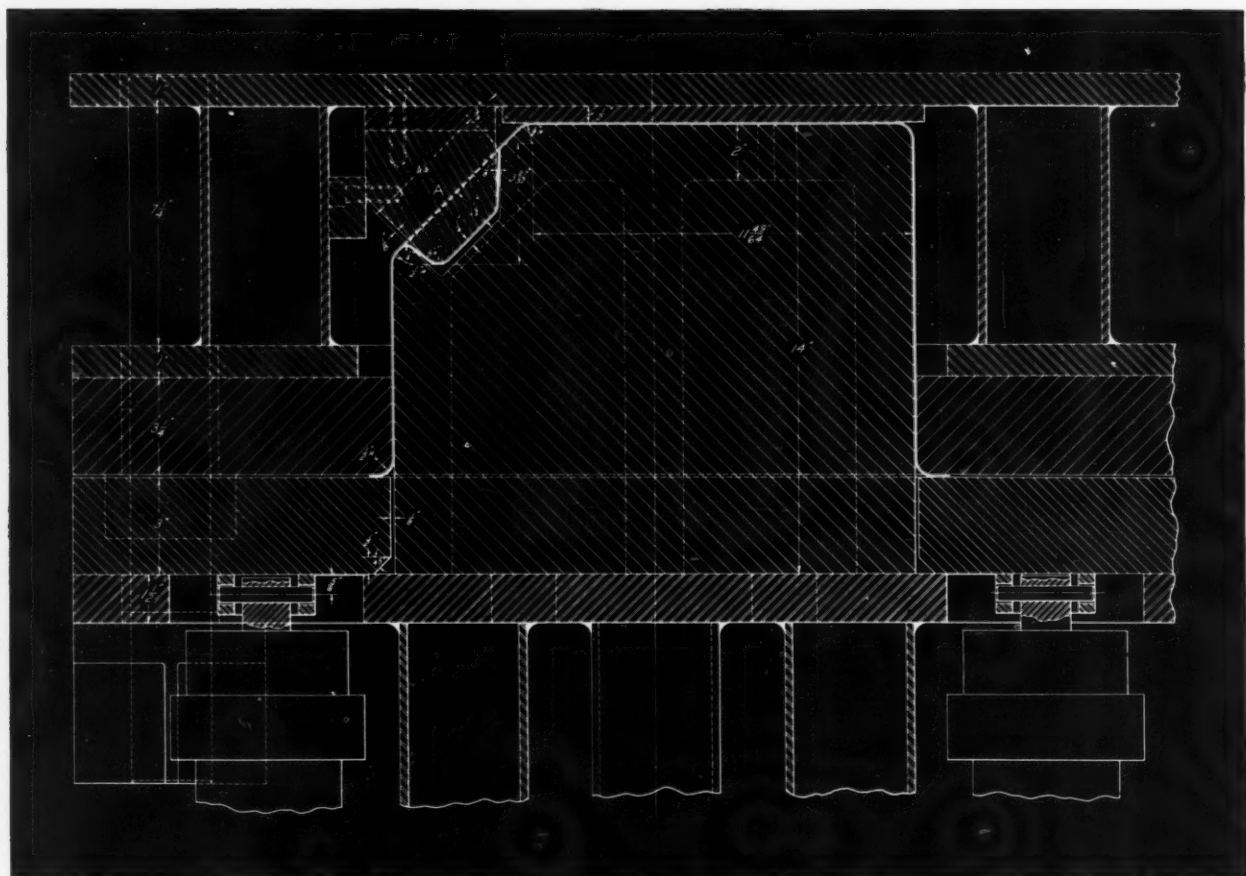
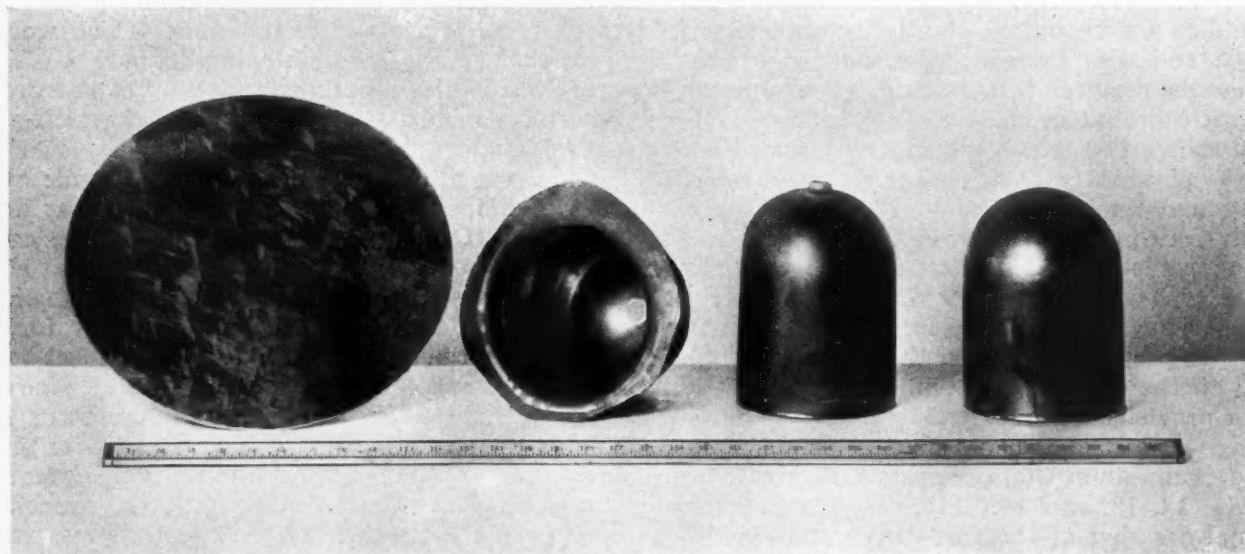


Fig. 13. The Drawing of the Inclined Surface on the Radar Box in Fig. 5 Presents a Material Disposal Problem which was Solved by the Provision of Punch A on the Upper Member of the Die Set Here Shown

Fig. 14. Dome-shaped Shells Such as Seen at the Right are Drawn from Magnesium-alloy Disks and Heliarc-welded together to Form Oxygen Bottles



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and platen. The use of inserts on the punch and the sectional construction of the upper die-ring held the cost of this die set to a minimum.

Dies of comparatively simple design were employed to produce the radar boxes, the die set in Fig. 12 being designed for the radar box shown in Fig. 1. Punch A, draw-pad B, and upper die-ring C are all made of cast iron, while the lower die plate D and plates E, F, and G are of mild steel. Air vents are provided on the punch at X and on the die base at Y. A tolerance of plus or minus 0.002 inch was specified on the space between punch A and ring C, all around these two members. The nominal width of this space is 0.085 inch.

A die with a unique design detail was devised for producing the large radar box shown in Fig. 5. This die is illustrated in Fig. 13. The upper die unit is provided with a steel insert A extending almost the full length of the punch, which forms a pocket in the stamping to compensate for the excess metal produced in drawing the inclined surface on the work. Owing to the large size of the punch, internal ribs were cast lengthwise and crosswise.

Magnesium disks 13 3/4 inches in diameter by 0.125 inch thick are drawn into dome-shaped shells of the type shown at the right in Fig. 14 by employing the die set illustrated in Figs. 15 and 16. Two of these shells—one with a boss on the domed end and the other without—are Heliarc-welded together to form oxygen bottles of sufficiently light weight to be carried comfortably on the backs of aviators. Each shell measures 8 inches to the top of the dome as it comes from the drawing operation, with the flange of excess stock still untrimmed. The second example from the left in Fig. 14 shows a shell in this stage. The trimmed length is 7 inches. The inside diameter of each shell is 5.4375 inches within plus 0.010 inch minus nothing.

The same die set is used for producing shells with and without the boss. Shells with the boss are first produced plain. Then after a steel insert A, Fig. 16, has been mounted on punch B, and a plate C with a central hole has been substituted on the upper die member for a similar plate without a hole, the shells are run through a second operation on the same dies to extrude the boss.

In the first operation, the blank disk is placed on draw-ring D, the ring being raised somewhat above the top of punch B. The domed shell is formed by a downward movement of the press ram, during which the blank is drawn over the punch by die member E. In the second operation, the boss is extruded as metal in the dome is forced upward into the cavity of plate C by insert A. At the same time, a center is punched in the top of the boss by a 1/4-inch diameter pin F. This provides a center to prepare the boss for drilling a hole through it to a diameter of 0.677 inch.

From Fig. 15 it will be observed that a gas pipe is provided both around the draw-ring and the

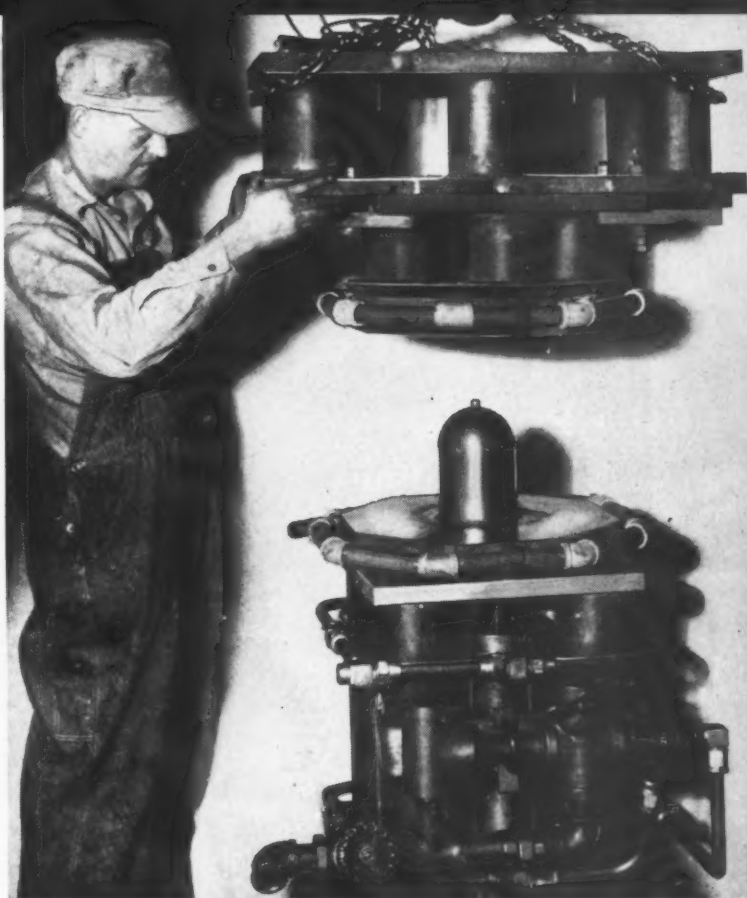
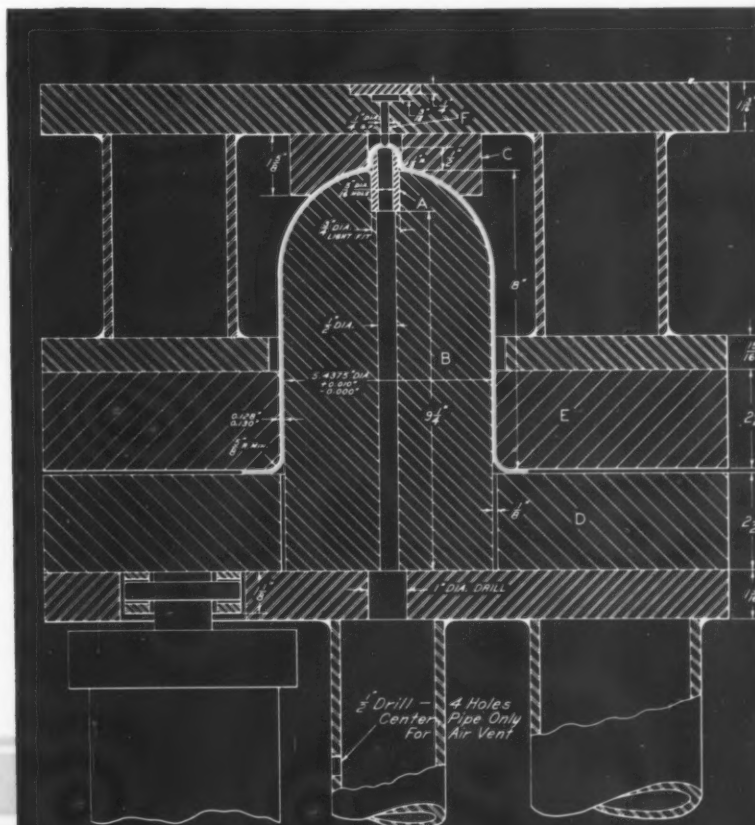


Fig. 15. Die Set Employed for Producing the Magnesium Oxygen Bottle Halves, the Same Die being Used for Producing the Shells with and without a Boss on the Dome

Fig. 16. Die Set Employed for Drawing the Oxygen Bottle Shells, the Dies being Shown Set up for the Second Operation on the Shells, in which the Small Boss is Produced on One Bottle Half



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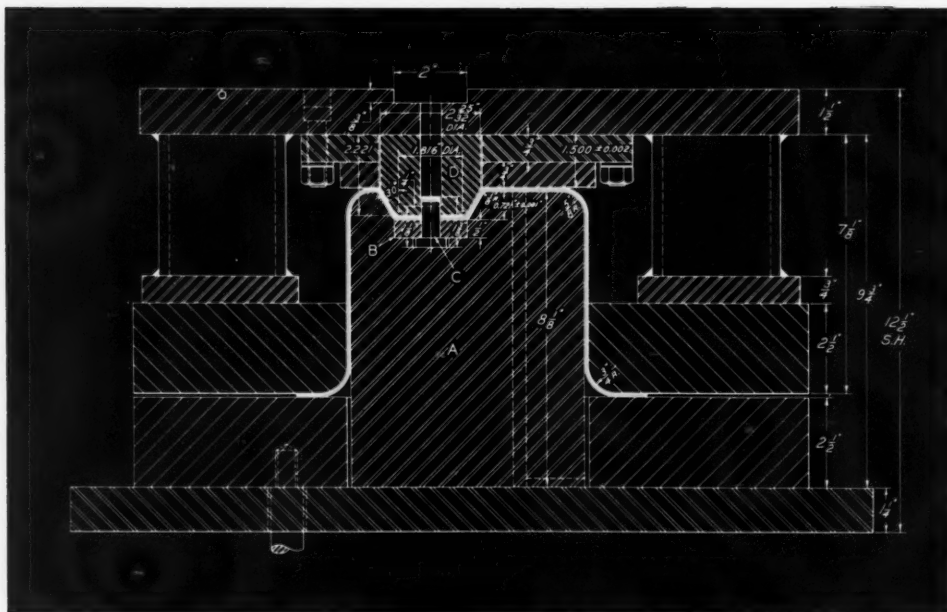


Fig. 17. Construction of the Die Employed in Drawing the Generator Housing Illustrated in Fig. 18. Pin C Pierces a Hole through the Material to Avoid the Development of Fractures in Forming the Boss

drawing member of the upper die unit, so that gas flames can be utilized to keep these die parts heated to the desired working temperature while they are in use. The other piping seen on the bottom unit in this illustration provides oil under pressure to the four hydraulic cylinders that back up the draw-ring.

A hand generator housing drawn from magnesium-alloy sheets 0.125 inch thick, and a cover for the housing drawn from 0.064-inch material are shown in Fig. 18. The housing, which is seen at the left, measures 6 1/2 inches long inside by 5 1/2 inches wide by 4 1/4 inches deep. The cover is made with an offset all around so as to fit over the housing, and a strip of magnesium is spot-welded all around the inside to form a pocket for the top edge of the box.

A unique feature of the drawing die for the housing is the means provided for forming the boss as the drawing of the part reaches completion. The die set is illustrated in Fig. 17, from which it will be seen that punch *A* was made with a conical depression at the top for forming the boss. There is a steel insert *B* at the bottom of the conical depression, which insures accuracy of the boss top, and a pin *C* of 1/2 inch diameter, which pierces a hole through the metal being formed at this point before the boss is completed. Unless the piercing were accomplished before the final forming, the metal would tend to fracture around the corners at the top of the boss. Slugs formed by the piercing operation are pushed up through a hole in the center of plug *D*, which is attached to the upper die member for forming the opposite side of the hous-

Fig. 18. Generator Housing and Cover Drawn from Magnesium Alloy. Production of the Housing at the Left Involves Drawing in Opposite Directions at the Same Time

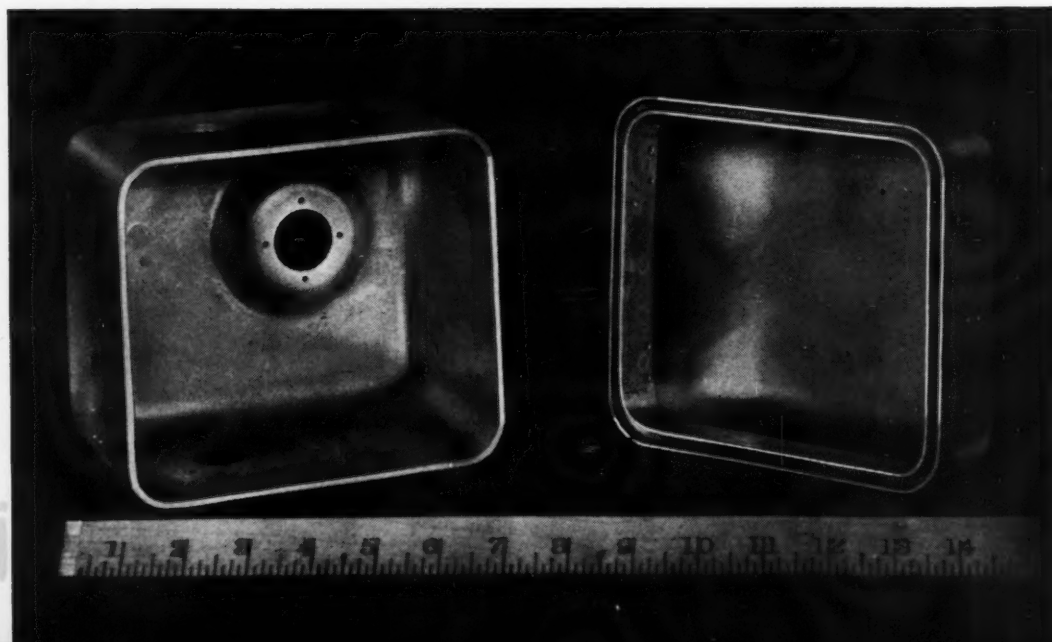
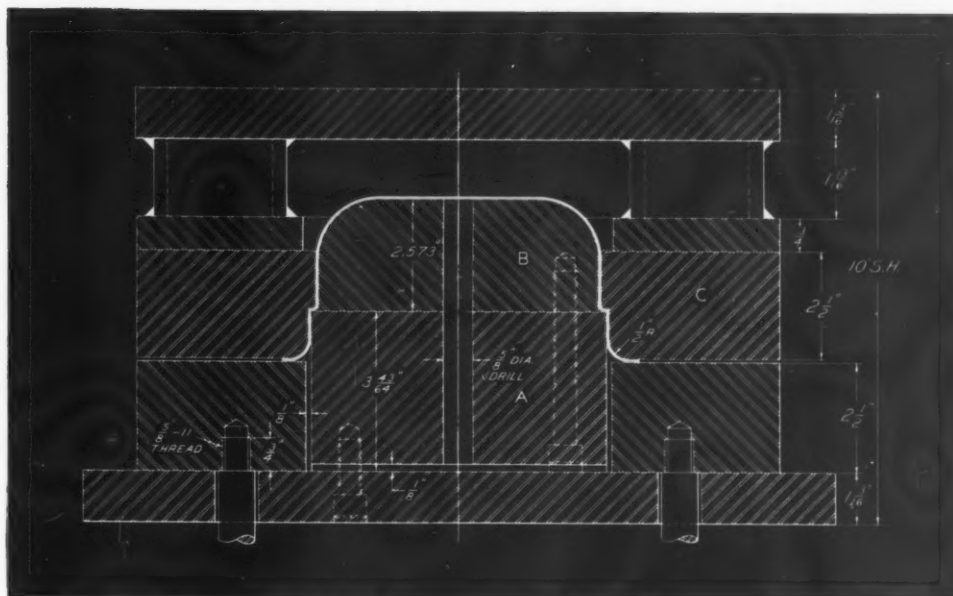


Fig. 19. The Punch on This Die Set, which is Used to Produce the Cover Shown in Fig. 18, is Made in Two Pieces and the Upper Die-ring is Made with an Internal Shoulder to Form Offset on Work



ing to that shaped by the punch. This operation constitutes an instance where a part is drawn in two opposite directions at the same time—a condition that would cause considerable difficulty with metals other than magnesium.

The method employed to form the offset around the cover to fit the box will be apparent from the drawing of the cover die, which is illustrated in Fig. 19. It will be seen that the punch is constructed of two parts *A* and *B*, which are joined in a line with the inside surface of the shoulder. The ring *C* on the upper die member which draws the outside of the cover has an internal shoulder to suit. A 5/8-inch diameter hole drilled through the punch provides a vent for the air, which would otherwise be trapped by the work as it is drawn.

In designing parts to be drawn from magnesium sheet, the tolerances specified should be as generous as possible, because if dimensions on the work must be held to, say, 0.003 inch, the die cost will be materially higher than if a tolerance of 0.006 or 0.008 inch is allowed. Radii, also, should not be specified smaller than necessary.

There is practically no limit with respect to the gage of magnesium that can be drawn. As a matter of fact, sheets as thin as 0.020 inch have been successfully handled in the Brooks & Perkins plant.

The advances that have been made in drawing magnesium alloys, as outlined in this article, are considered remarkable, in view of the fact that sheet magnesium has been available only since the beginning of the recent war.

How to Best Insure Full Employment

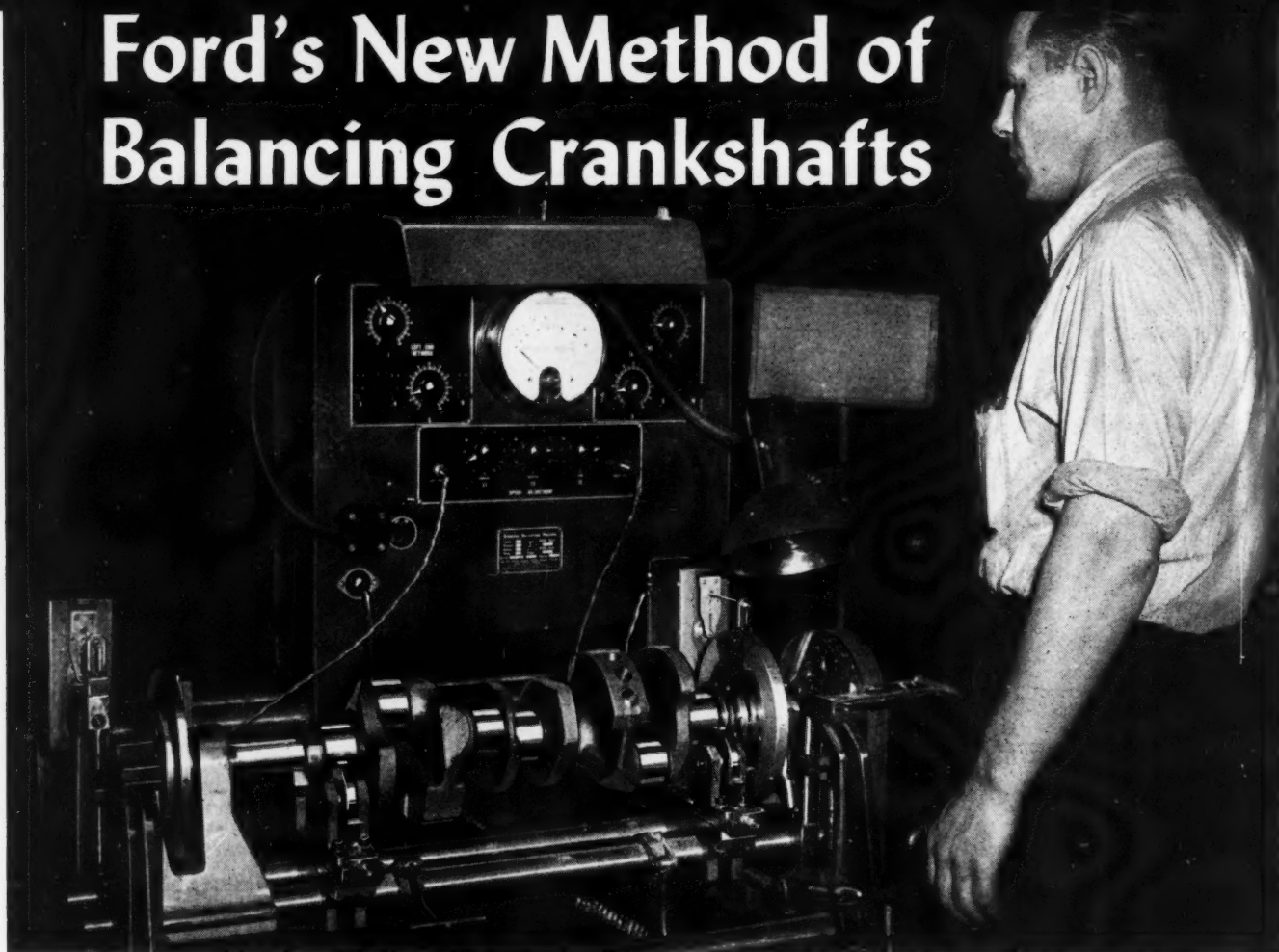
Of course, everyone is for a country where every man willing to work can find employment. But we are also for a country where every man who is willing and able to *create work by creating a job-giving enterprise* can find the opportunity to do it. While we cry out for full employment and jobs for all, we carry on an incessant warfare upon the job-makers, the enterprise builders, the employing industries of the nation. The plan to create full employment by a Government guarantee, backed by Government borrowing, is not a plan to make jobs for all, but a plan that will create unemployment, because it will bankrupt private industry and ultimately bankrupt the Government itself. . . .

We must set about at once examining our whole social structure to determine what Government,

labor, industry, states, and cities are doing that is crippling the productive energies of the country. This means we must decide now what are the forces which have stopped the flow of private investment in this country for fifteen years, and remove them. We must unchain private industry and take the Government, the labor restrictionist, and the business monopolist off its back. The principal handicaps are those restraints imposed by Government and by private organizations of labor and capital.

We must choose between capitalism and socialism. We cannot have both. And if we want a system of private ownership under which alone it is possible for men to have freedom, we must do the things that will make that system work.—*John T. Flynn in the "Reader's Digest"*

Ford's New Method of Balancing Crankshafts



By CHARLES O. HERB

BALANCING machines designed to reveal the location and amount of dynamic unbalance in crankshafts, flywheels, and other rotating objects are primarily intended for balancing rotative parts whose dynamic balance can be checked and corrected without the addition of auxiliary weights. However, in the balancing of some rotative parts, particularly crankshafts having four crankpins

spaced 90 degrees apart, allowance must be made for the weight and centrifugal force generated by the large ends of the connecting-rods, which include the bearings, bearing caps, and studs that attach the connecting-rods to the crankpins, and also for a portion of the weight of the reciprocating pistons, wrist-pins, piston-rings, and small ends of the connecting-rods.

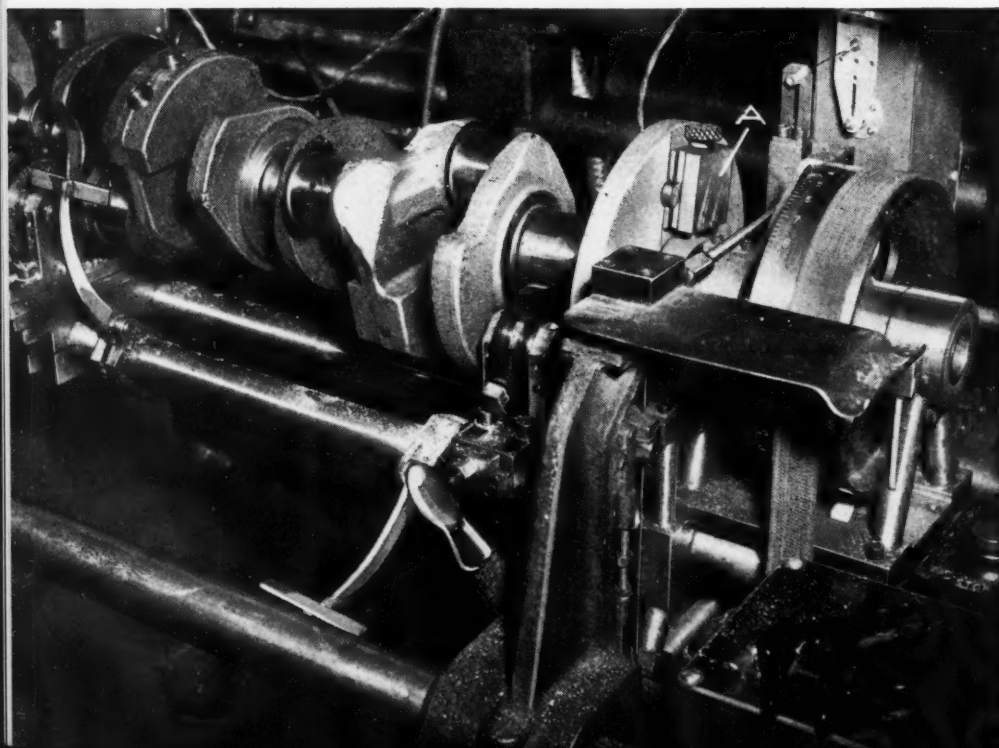


Fig. 1. Close-up View of a Typical Balancing Operation, Showing at A the Adjustable Counterweight Provided on the Headstock

Fig. 2. The Former Time-consuming Practice of Attaching Bob Weights to Crankshafts for Balancing Operations, as Here Shown, has been Eliminated by Providing Adjustable Counterweights on the Balancing Machines

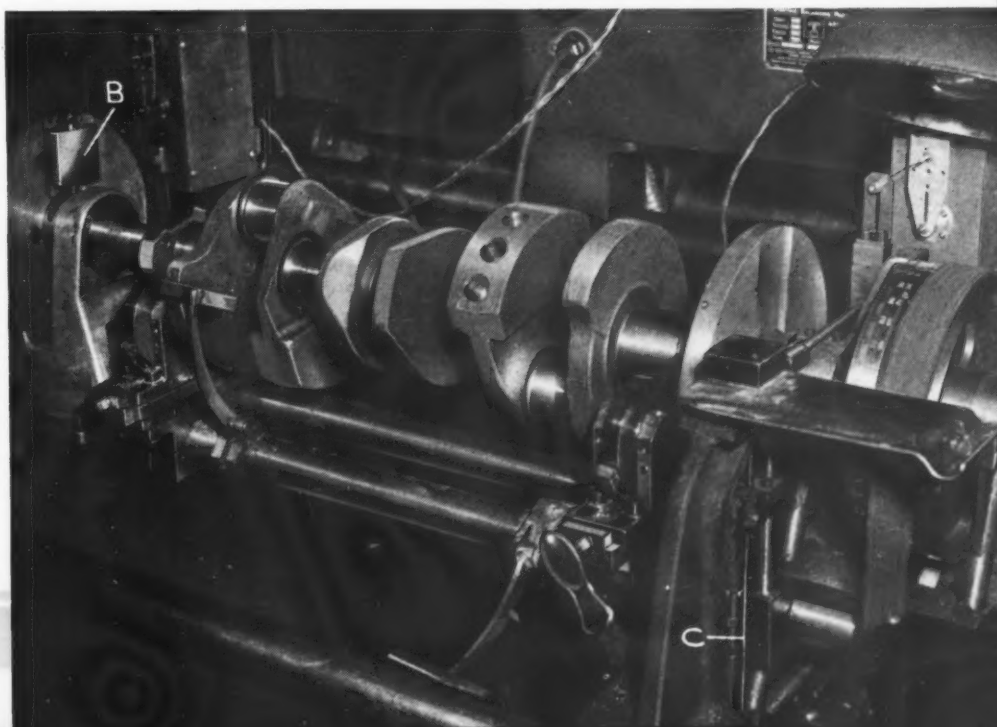


In past Ford practice, the weight for which allowance had to be made was simulated by attaching temporary weights to the crankshaft for the balancing operation. The total weight was proportionate to that of the elements enumerated, and was obtained by attaching "bob weights" to the crankpins in the manner illustrated in Fig. 2. Because of the high degree of accuracy which must be maintained during a balancing period, the bob weights had to be precisely machined and attached with great care to the accurately ground crankpins. The importance of bob-weight accuracy will be evident when it is realized that the centrifugal force exerted by a weight of 1 ounce at a radius of 1 inch from an axis is 256 ounces with a rotative speed about the axis of 3000 revolutions per min-

ute, which is an operating speed of internal combustion engines.

High-volume production requires that hundreds of crankshafts be tested for dynamic balance daily, and when bob weights are used under such a condition great numbers of accurate weights must be prepared, stored, and maintained in satisfactory condition for immediate use. In addition, different sizes of weights must be kept on hand when crankshafts of different weights or lengths are being manufactured. The use of bob weights becomes even more complicated when, to achieve a high standard of dynamic balance, it is necessary to attach bob weights of one weight to the inner pins of a crankshaft and of another weight to the outer pins. Under such a condition, an even greater

Fig. 3. Another View of a Balancing Operation, in which the Adjustable Counterweight Provided on the Tailstock can be Seen at B



BALANCING FORD CRANKSHAFTS

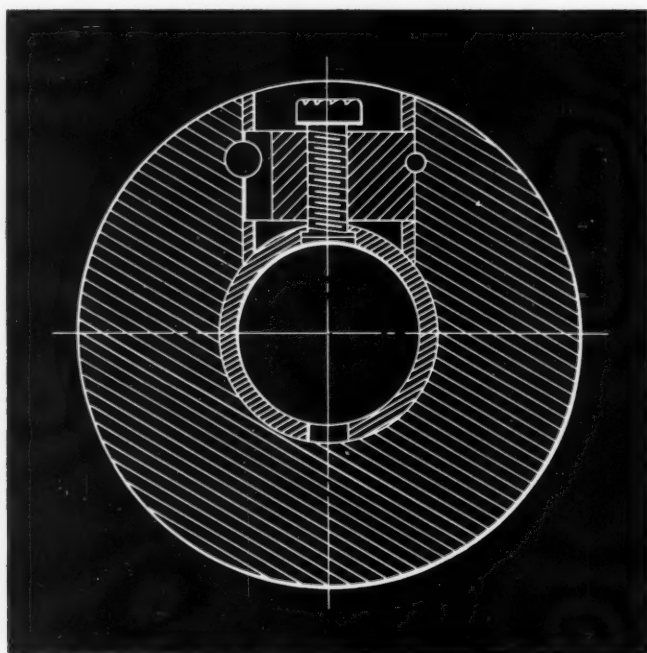


Fig. 4. Cross-sectional View through a Tailstock Assembly, Showing Manner in which Radially Adjustable Counterweights are Attached

number of bob weights must be kept on hand, and there is the risk that bob weights of the wrong weight will be used on the respective crankpins.

The use of bob weights increases the equipment cost and also the number of man-hours required for the manufacture of an engine under mass production methods. With an adequate supply of bob weights on hand and a trained personnel, the Ford Motor Co. found that the time spent in attaching and removing the weights and in conveying the crankshafts to and from the benches where these operations were performed was actually greater than the total time consumed in the balancing operation.

Ease of handling the crankshafts during the balancing period was also a consideration in effecting a change in the balancing method, because the bob weights increased the weight of the average 90-degree crankshaft about 12 to 13 pounds. Crankshafts of this type range in weight from 65 to 71 pounds without the bob weights, and they are generally placed on and removed from conveyors and testing machines by hand. A total weight as great as 83 pounds, therefore, was of prime importance from the standpoint of the workman's speed, efficiency, and safety.

The need for bob weights in balancing Ford crankshafts has been eliminated by providing the standard dynamic balancing machines with built-in adjustable counterweights that rotate in synchronism with the crankshaft being balanced, so as to create the same condition as was obtained from the

use of the demountable bob weights. Both the machine and the positions of the built-in counterweights can be adjusted so as to accommodate crankshafts and other rotative objects of various sizes and weights. No change has been made in the drive of the machines or the method of registering the location of points of dynamic unbalance in the crankshaft.

One of these adjustable counterweights is provided on a special flange on the headstock, as shown at A in Fig. 1, and another is provided on a special flange of the tailstock, as illustrated at B in Fig. 3. Fig. 4, which is a cross-sectional view through a tailstock assembly, shows the manner in which the counterweights are assembled so as to be radially adjustable. The two counterweights are diametrically opposite each other with respect to an axis extending through the headstock and the tailstock. The force of each counterweight is decreased as it is moved radially outward from the axial center of the crankshaft, so that adjustments can be conveniently made to suit the particular crankshaft being handled. When the counterweights have once been located in accordance with the requirements of a certain crankshaft, they must remain in that position.

In order for the counterweights to produce a moment of couple sufficient to permit the balancing of the primary forces on the crankshaft, they must rotate in synchronism with the crankshaft and maintain a fixed position relative to it. Although the counterweights revolve about an axial plane common to the crankshaft, they are positioned obliquely relative to the throws of the crankshaft. Their angular and radial positions are determined by means of data developed mathematically.

This improvement could be applied to all dynamic balancing machines in common use today. Both Olsen and Gisholt machines are used in balancing Ford crankshafts. On the Olsen machines, the crankshaft rotates in a fixture, the base of which rests on pivot points located directly below the crankshaft in a predetermined plane. The oscillations of the crankshaft as it rotates on the pivoted stand are used to compute the amount of excess metal that must be removed from the crank cheeks.

The balancing method consists of rotating the crankshaft, with the supporting base pivoted on a point located directly in line with the plane from which excess material is to be removed. The first step entails locating the pivot point in the same plane as the center of one of two thick cheeks and in the same plane as the axis of the crankshaft; rotating the shaft in synchronism with the built-in counterweights; and registering the amount of vibration. The pivot point is then moved to a similar position relative to the second thick cheek, and the process is repeated. Computations are made from the amount of vibration registered during

BALANCING FORD CRANKSHAFTS

each step, and a quantity of metal is removed from each of the two thick cheeks in accordance with the computations.

The crankshaft is then returned to the machine and the process is repeated, except that the pivot points are successively located in the same planes as the thin cheeks and metal is removed from those cheeks to bring about a condition of true dynamic balance.

On Gisholt machines, the fixture is suspended by means of thin wires such as indicated at *C*, Fig. 3. The amount of unbalance in either the heavy cheeks or the thinner end cheeks is determined by electrical and electronic means within the control unit, and shows on the dial which can be seen in the heading illustration. The angular position of unbalance is read on a graduated pulley at the right end of the machine. There is a stroboscopic light above the pulley, also seen in the heading illustration.

In each of the steps described, the crankshafts are rotated in synchronism with the built-in counterweights without the counterweights being adjusted. As the headstock and tailstock units are in both static and dynamic balance without the counterweights, it is evident that any unbalance in the mechanism during operation is developed either by the counterweights or by the crankshaft being checked.

When a crankshaft is loaded into one of these machines, the flywheel end is positioned against the headstock flange, so that drive-pins on the headstock can be inserted in the holes provided on the crankshaft for attaching the flywheel. It is the practice to drill these holes in a definite relation to the throws of the crankshaft. This facilitates the placing of a crankshaft in a balancing machine so that the proper radial and peripheral relationship between the throws of the crankshaft and the counterweights of the balancing machine

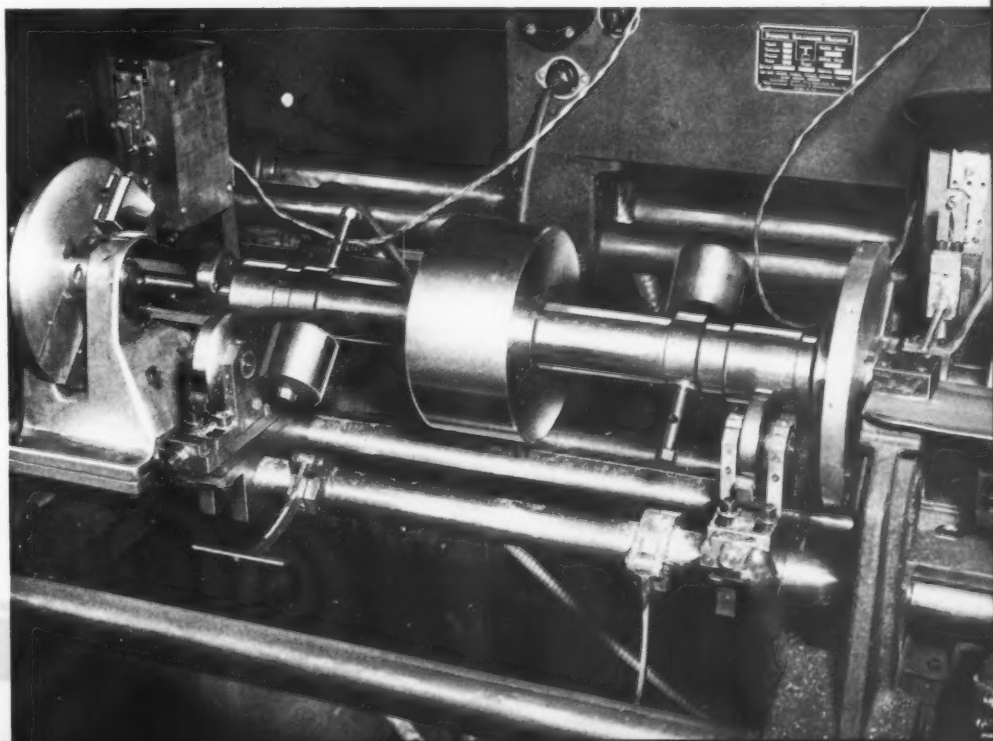
will be obtained. In the event of an alteration in the crankshaft design that would change this relationship, the drive-pins on the headstock faceplate can be adjusted peripherally in relation to the headstock counterweight.

A slotted hole arrangement on the tailstock permits a similar angular adjustment of the tailstock counterweight. The opposite or forward end of the crankshaft is supported in a yoke attached to the tailstock. This yoke is equipped with a pin that engages the keyway commonly machined in this end of crankshafts for fastening drive pulleys, timing gears, etc. The keyway is machined in a definite position with respect to the No. 1 crank throw and the holes in the flywheel flange. Hence, it provides a means of imparting synchronous motion to the flange on which the tailstock counterweight is mounted, and maintains these units in a definite relation with the headstock flange and counterweight.

In making a set-up, slight variations in the position of the keyway with respect to the crank throws or the holes in the flywheel flange can be compensated for by peripheral and radial adjustments of the counterweights. The longitudinal distance between the headstock and tailstock of the balancing machines can be varied by sliding the tailstock spindle along the parallel support on which it is mounted.

A master of the type illustrated in Fig. 5 is employed in setting up and periodically checking the balancing machines. This master is provided with a heavy weight in the center which serves to prevent "jumping" of a revolving crankshaft due to centrifugal force. There are two additional weights between the heavy counterweight and the ends of the crankshaft which serve the same purpose as bob weights mounted on a regular crankshaft. These weights have projecting studs which can be adjusted to insure accurate balance of the master.

Fig. 5. Master Employed in Adjusting Crankshaft Balancing Machines to the High Degree of Accuracy Necessary for Balancing Operations



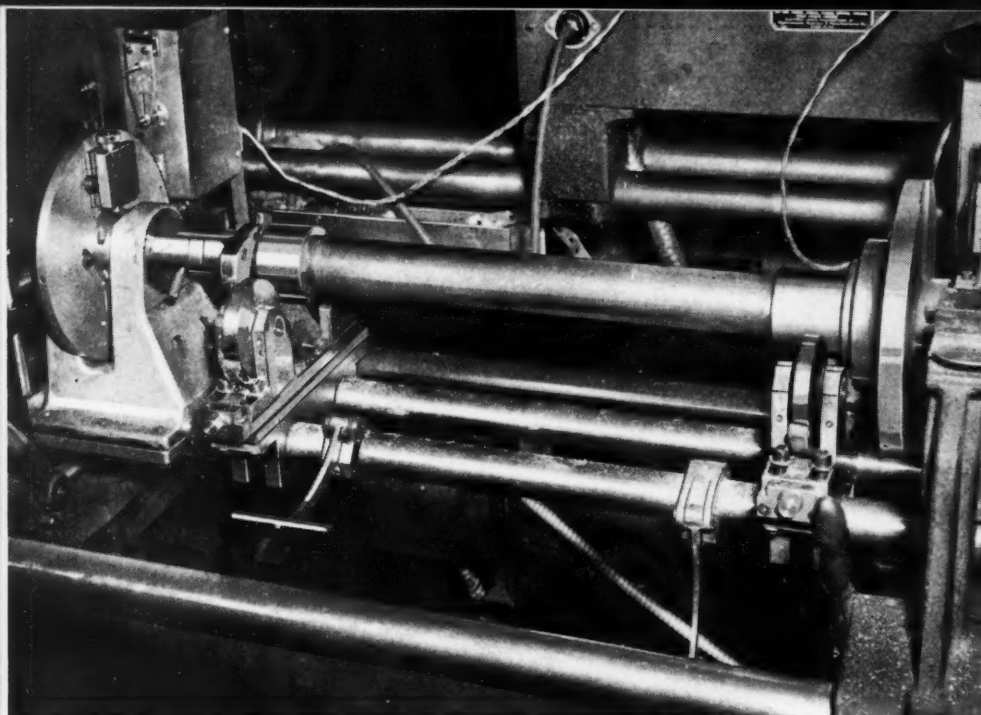


Fig. 6. Another Master which is Employed for Lining up the Rollers that Support the Crankshaft in Line with the Headstock and Tailstock Counterweights

The practice is to check each machine at least every two or three days.

Another master of the type shown in Fig. 6 is used in the crankshaft balancing department for lining up the rollers by which the crankshafts are supported in a balancing operation, so as to insure that the crankshaft will be in line with the counterweights. At the headstock end, a flange on the master engages a pilot of large diameter, while at

the tailstock end a sliding pin in the center of the master is inserted in a hole in the tailstock spindle. In lining up, the rollers are adjusted until the proper "feel" is obtained when the rollers are revolved by hand against the master.

The simple improvement in the construction of standard balancing machines described in the foregoing is expected to effect substantial savings in crankshaft balancing operations.

A Manufacturer-Economist Appraises Labor's Trend Toward Inflation

IN an article in the *New York Times*, Ralph E. Flanders, well known as a machine tool manufacturer, economist, and bank president, calls attention to the current inflationary dangers. He points out that the causes of the trouble ahead are not to be sought in business or financial circles, as in the late twenties, but in an entirely new quarter—the great national labor unions. "Strangely enough," says Mr. Flanders, "they, in turn, show signs of the same illusions from which business suffered in the twenties. The present prospect is that the inflation spiral is most likely to come in the area of wages, costs, prices, and cost of living, and its regenerative effects on wages again. To the extent that increased wage demands compel a rise in prices in industries whose wages are not below prevailing rates, to that extent union policy is endeavoring to purchase goods yet unmade—to buy more than it can produce.

"The present danger of feeding an inflationary flame appears, then, to come from labor. It is im-

portant to point this out clearly, strongly, and repeatedly. New responsibilities devolve upon labor leadership with its new power. Corresponding responsibilities devolve upon business to oppose unwise labor policies whenever and wherever they appear. Such opposition is in the interest not only of business, but of the general public and of the wage-earner himself. If the employer group can keep its 1929 experience in mind, it can act with effective humility.

"To the extent that such business opposition is wise and in the public interest, to that extent will it find a common meeting ground with correspondingly wise and publicly minded leadership of labor. As this meeting of minds takes place, and only if it does take place, will Government be released from an impossible task of mediation and control which it cannot perform. Only as it takes place will another tailspin in production and consumption be avoided and a healthful progress toward a higher standard of living be maintained."

System for Handling Single-Point Tools at Watervliet Arsenal

By LIEUTENANT COLONEL E. G. MOFFAT

The Methods that have been Adopted at the Watervliet Arsenal to Promote Economy in the Use of Cutting Tools are Applicable in Any Large Industrial Plant

IN the following is abstracted a paper read before the recent annual meeting of the American Society of Mechanical Engineers. The problem referred to is one to which comparatively little attention has been given in the past, probably because it has been supposed that the problems in each plant vary and that a different system must be worked out to cover the particular conditions in each organization.

Carbide tools are expensive, and to the larger user they represent a tool inventory high in dollar value. Before the adoption of the present system at the Watervliet Arsenal, there were several thousand single-point carbide-tipped tools in circulation at one time. The daily requirement amounted to the handling of 2000 lathe tools. As the production schedules of the Arsenal increased, it became evident that the greatest problem was the handling of single-point tools in such a way as to insure that each operator had enough tools at all times, and thus prevent a stoppage of production.

Before going into the details of the present system of handling single-point tools, the old system will be referred to. All carbide tools originated in the carbide section of the grinding department, where the carbide blanks were brazed to the tool shanks. The unground tools were then placed in a storage crib and held for later distribution to the various grinding sections in each machining department. These grinding sections were equipped to grind and service all types of high-speed steel and carbide tools except the gun-boring reamers, which were and are still handled in special reamer sections.

The tool-cribs received the new or reground tools and distributed them to the operators upon receipt of dull or broken tools. The receiving tool-crib attendants turned over the dull and broken tools to the department grinding sections, which were located adjacent to the tool-cribs. Here they were inspected and then reground or scrapped.

To replace scrapped tools, the cribs called on the carbide section of the grinding department, which furnished unground tools. These were then forwarded to the machining department's grinding section for grinding and issue through the cribs. The only advantage this system afforded was that tools were always transported unground, and the handling damage was nil. This advantage, however, was far outweighed by the following disadvantages:

1. The highly skilled grinding employees in the grinding sections were being called upon to do rough and low skilled grinding.

2. Machine operators were going directly to the grinding sections and were having non-standard angles ground on tools which resulted in shorter tool life.

3. Tool chasers, machine operators, and crib attendants were taking tools to the grinding sections and waiting until the tools were reground. This lowered the efficiency of the grinding section and also resulted in a loss of manpower.

This system, while it was simple, was inefficient in that it did not insure proper distribution of tools, which, in turn, resulted in an overly large inventory of tools accumulating in the shop, and a shortage of tools at the machines, particularly on the night shifts.

Survey for Determining Possible Improvements in Handling Methods

A survey was made of the single-point tools to determine what improvement could be made to correct the tool situation. This study showed that each lathe operator turning gun tubes required an average of ten lathe tools per shift, and that there were at this time in circulation over 5000 carbide-tipped lathe tools. Based on the tool demand in each shop, a definite tool allotment was set up for each issuing crib.

A further study was made of the sizes of tools required, and it was determined that all gun turning at that time could be handled with two sizes of tools, 15/16 by 1 1/2 and 1 by 2 inches, both in left- and right-hand tools. These two sizes were standardized and all others eliminated. An analysis of the manpower revealed that thirty-five grinding operators were required per thousand tools ground, and that the requirements for each twenty-four hours necessitated the grinding of 2000 carbide lathe tools.

Methods Adopted as a Result of the Survey

As a result of this study, it was decided to centralize in one area, on a production-line basis, all the grinding of carbide lathe tools. Lay-outs were completed and machines brought in from the various grinding sections. The lay-outs showed that by operating two shifts with fourteen people on each

shift, 2000 tools could be ground in a floor area of 600 square feet.

To place the new system in operation, the method of handling tools was changed. The tools are now sent from the tool-cribs, in lots of 50 to 100, to the new grinding section, where they are received by the sorter, who checks in the tools and issues a like number of ground tools to be returned to the tool-crib. The sorter inspects the tools and separates them into three categories which are handled as follows:

1. Tools that can be reground are placed on a pallet on a conveyor in lots of ten for movement to the first operation.

2. Tools with badly chipped or broken tips, which require renewal, are routed to the brazing room for retipping.

3. Tools that are too short or badly damaged are sent to the salvage department to be scrapped.

To maintain the proper quantity of tools in circulation, the sorter replaces the rejected tools with unground tools taken from stock. This system maintains a balanced flow of tools, and automatically keeps the inventory at the proper level.

The only record kept is a daily record sheet, which is posted by the sorter, who records the following information:

1. Tool usage by department and daily total.
2. Number of worn-out tools.
3. Number of broken tools.
4. Number of resharpened tools.

From this record, a check is maintained on the various departments' requirements, and excessive breakage is easily spotted. These records are constantly referred to by the methods engineer in charge of carbides, who uses the information for investigation of tool trouble.

Operations Required in the Preparation and Grinding of Tools

In laying out the grinding department, it was decided to use a gravity type roller conveyor to minimize the handling time between operations. The first two operations on the line are milling operations, which are performed for the purpose of eliminating the snagging of steel from under the nose and side of those carbide tools having chipped tips. Experience showed that these two operations had to be performed on 25 per cent of the tools returned to cribs. The machines used are vertical milling machines with 4-inch diameter, 6-tooth negative-rake carbide milling cutters running at 412 R.P.M. with a feed of 6 inches per minute. In both operations, the fixture is designed to hold left- and right-hand tools. The 12-degree clearance and 15-degree lead angles to be ground on the tools are incorporated in the fixtures.

The next three operations are performed on a No. 14 Hammond grinder with the table set at 10 degrees for the clearance angle. The abrasive wheel used is a 14- by 4- by 11-inch cup-wheel, steel back, Carborundum Grade GC60-18-VW. The grinding time for each operation is one minute.

Final Diamond Grinding Operations

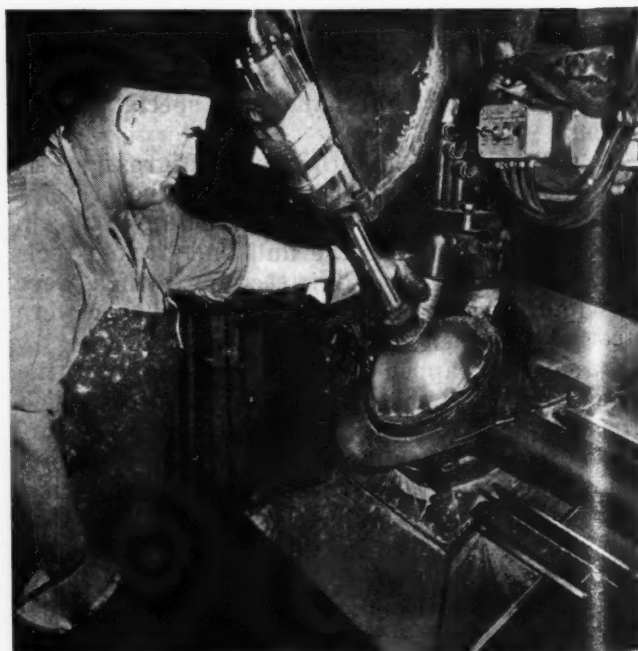
After the grinding of the top of the carbide tip, the tools on the pallets are moved to the lower deck of the double-deck conveyor for the final diamond grinding operations. The operator who grinds the chip-breaker slides the pallet from the lower deck to his shelf and grinds the chip-breaker with a 6- by 1/4- by 5/8-inch Norton D120-N100M-1/16-inch diamond wheel on a CB76 Hammond chip-breaker grinder. On the other side of the same machine, the 6-degree primary clearance angles are lapped on the nose and side of the tip. For this operation, a 6- by 3/4- by 1 1/4-inch Norton D120-N100M-1/32-inch diamond wheel, with 3/4 inch rim, is used. Upon the completion of the lapping operation, the tools are placed on their pallets on the top deck of the conveyor and are dispatched to the inspector at the end of the line.

The inspector checks the tools for proper finish, gages the angles, and under an Inspectograph, checks the tools for brazing and grinding cracks. After checking, the inspector places the ground tools in the finished tool bin, from where they are issued by the sorter to the tool-cribs in exchange for the incoming tools.

This system has eliminated the tool-handling problems that were encountered in the previously outlined system, and has resulted in the machine operator's receiving better tools. After the installation of the new system, the total number of tools in circulation dropped to 3500, and the cost of the set-up and rearrangement was rapidly written off.

* * *

Automatic Unionmelt Welding has Become a Standard Manufacturing Technique in Automobile-part Production Plants. One of a Battery of Three Unionmelt Machines is Shown Here Welding the Differential Housing to an Axle Assembly for Trucks



Jig-Boring and Jig-Grinding Machines Promote Interchangeability in Toolmaking

Lower Tool and Die Costs and Increased Tool-Room Capacity are Attained by Reducing the Time Necessary for Locating, Boring, Grinding, and Inspecting Holes

By J. R. MOORE
Moore Special Tool Co., Inc.
Bridgeport, Conn.

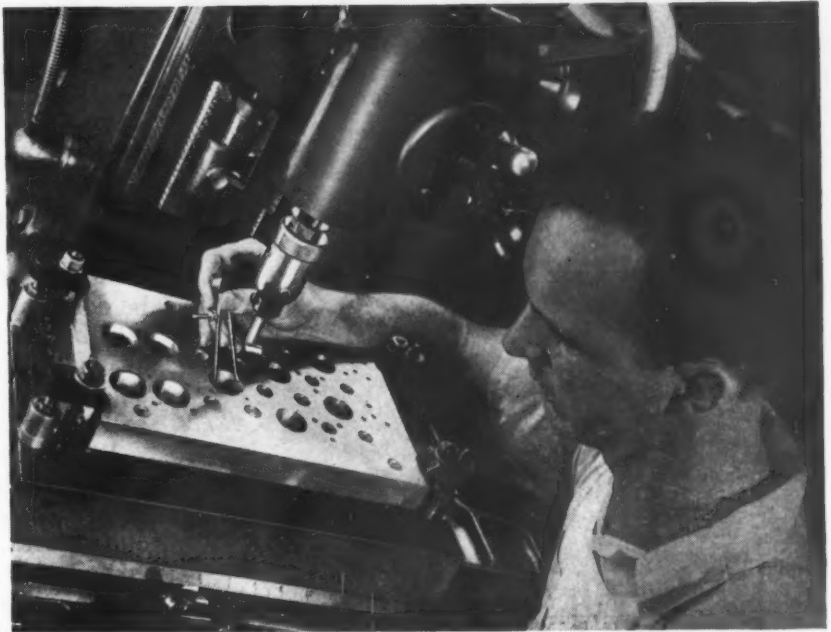


Fig. 1. Jig-boring Machine Set up for Rough-boring the Holes in a Quadruple Die of the Type Shown in Fig. 4

THE toolmaking industry was one of the first to promote interchangeability in the manufacture of parts. However, it has been one of the least progressive in introducing this principle into its own operations. The principle of interchangeability, since 1798 when Eli Whitney first used it in the manufacture of muskets, has so greatly reduced production costs that its acceptance in any progressive industry is mandatory. The toolmaker's work has always been a "one at a time" proposition—fitting parts together rather than making them to exact dimensions. The fact seems to have been overlooked that tool parts can be assembled and will operate just as well as any other manufactured device if made on an interchangeable basis, thus insuring the highest possible accuracy and economy.

It is surprising that no better solution was developed for the toolmaker's hole-locating job until recent times. The jig-boring machine was developed about twenty-eight years ago and the jig-grinding machine within the last five years. The jig-borer is advantageous for the locating and finish-boring of parts left soft, and for the rough-boring of holes before grinding, as shown in Fig. 1. The jig-grinder provides an economical method of relocating, finish-grinding, and correcting holes in hardened parts, as shown in Fig. 2. Increased accuracy and speed and the convenience with which they are achieved are advantages of using these two machines.

It is possible to perform the grinding operations in a lathe or internal grinding machine after using the jig-borer for establishing location, and this is common practice.

The question may be raised as to why it is necessary to employ the jig-borer on parts that are eventually to be ground. It may also be pointed out that accuracy before hardening is unessential, inasmuch as the holes are to be ground subsequently. The fallacy of this reasoning is that the grinder operates at a disadvantage when excessive amounts of material are left for grinding. The hole must be reasonably accurate before grinding in order to avoid excessive grinding allowances. Layouts or buttons would be necessary to locate the holes if the jig-borer were not used. This work can be performed very rapidly on the jig-borer, since the ultimate accuracy is not required.

The jig-boring and jig-grinding machines employ the same measuring principle and system of coordinate location. Coordinate calculations can be used throughout the entire job—in boring the soft pieces and in finish-grinding the hardened parts. This is especially important in inspection, which subject will be discussed in a subsequent article in MACHINERY.

Coordinate calculations should be made by the engineering department prior to starting the job, in order to attain the fullest use of both machines and save the time of the toolmaker. Engineering drawings are as important to toolmaking and die-

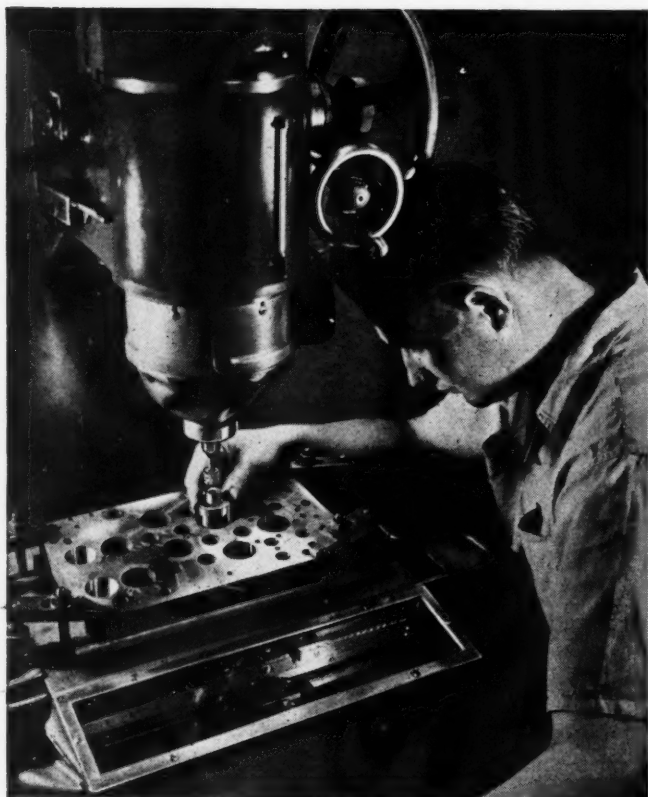


Fig. 2. Quadruple Die being Jig-ground after Boring and Hardening

making as they are to the manufacture of any other part. Accuracy must be established and controlled for any part with reference to its function. The engineer must have some method of indicating just what degree of accuracy is required for any given dimension. This is the basis for interchangeable manufacture. Too often, drawings or sketches of tools or dies indicate no tolerances, and the tool or

die is made as accurate as possible. An unnecessary degree of accuracy in the tool-room is a waste of the toolmaker's time and inefficient use of the equipment.

Cutting tools are not interchangeable between the two machines. Proper selection of cutting tools is important to their operation. End reamers provide the most rapid way of finishing holes in the jig-borer. This method is not as accurate as single-point boring; however, it is good enough for parts that will eventually be ground.

The operation of producing holes in jig boring and grinding machines consists basically of three steps: First, locating or establishing the desired position of the hole in the work-piece. Second, cutting or removing material by drilling, boring, reaming, grinding, or lapping. This cutting must be done in such a manner as to insure that the hole will be of the required size and in the desired position. Third, checking or inspecting. Rapid and efficient means for accomplishing this step are fully as important as for the first two.

With previous methods, the toolmaker had the choice of either accepting the errors introduced by distortion, or of correcting them by a long drawn-out process. The coordinate location system which is built into the jig-borer and jig-grinder encourages working to exact dimensions.

Quicker delivery of new dies to the press room is an important advantage derived from using the jig-boring and jig-grinding machines. With conventional toolmaking practices, the die-block must be made and hardened first, before any of the other parts can be made. The stripper and punch plate must wait until the die has been hardened, since there is no way to predict the condition or positions of any of the holes in it. In using the jig-boring and jig-grinding machines, all parts are made strictly to dimensions, and the die, stripper, punch plate, punches, and bushings can be made concurrently.

The ten-station progressive die shown in Fig. 3 is a typical example of the savings that can be accomplished by interchangeable manufacture. This die would represent about two thousand man-hours of labor if made with conventional transfer methods. In addition, only one or two men could work on it at a time, since the parts would have to be made in progressive steps. Delivery, therefore, would require about six months. Interchangeable manufacture permitted all the parts of this die to be made concurrently. The bored die sections, after being hardened, were completely assembled in the die set and located on their own dowels. All holes were then ground in one set-up. The stripper, the four hardened stripper inserts, and the punch pads were bored and ground

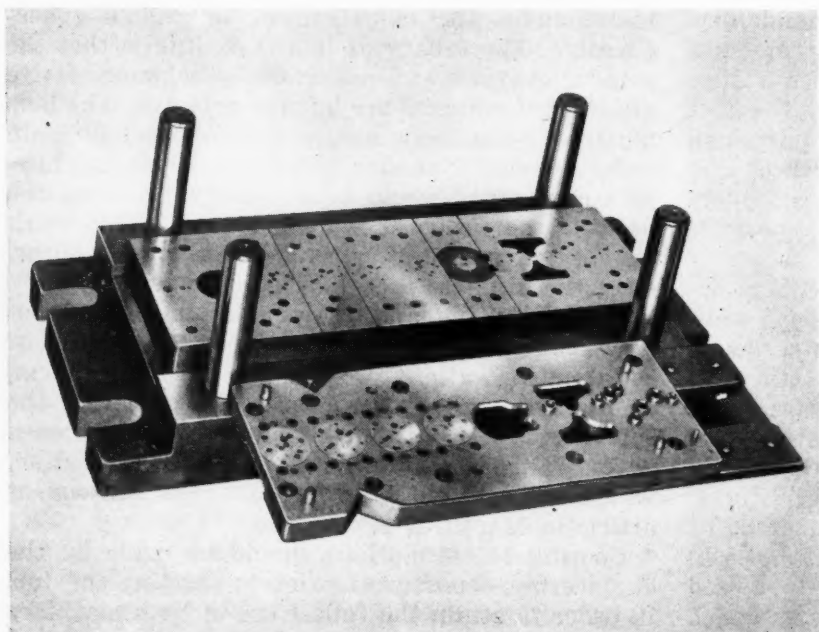


Fig. 3. Ground Progressive Die with Ten Stations

during the time that the die-blocks were being fabricated. From six to eight men were working on the various parts at one time. The number of man-hours was cut to one thousand, and the die was delivered in six weeks. The life of the ground die, due to its high accuracy, is from two to ten times that of an unground die.

Another example of the use of the interchangeable parts and assembly principle in toolmaking is the quadruple die shown disassembled in Fig. 4. This die is used to produce four splined washers, shown with their scrap in Fig. 5, at each press stroke. The accuracy required for this operation was extremely high. The material is only 0.010 inch thick, and the fragile blanks must be kept flat and free from burrs.

To maintain the flatness required, and yet permit stacking, a combination compound and progressive die design was adopted. The splined center hole and most of the periphery of the washer were cut at compound stations. The remainder of the periphery was then cut in the final push-through station. The first station pierces three small holes, 0.030 inch in diameter, in two rows of washers. In the finished washers, these holes are spaced around the splined center holes. The round center holes for the other two rows of washers are also punched at this station. These center holes are used for piloting at the second station, where the three small holes in the other two rows of washers are pierced. Splined holes for two washers are also pierced at this station, the round center holes for these washers being omitted.

The second and third stations act as compound stations, where most of the cutting is performed.

The two splined holes are used for piloting at the third station, where the splined holes for the washers in the other two rows are pierced. The slugs from the splined piercings are pushed up through the die inserts. This accounts for the milled-out air chambers in the punch plate. When the slugs reach these chambers, they are blown out of the punch plate by air blasts emanating from nozzles at the end of the air pipe.

The periphery of the blank is not completely separated from the scrap at these stations. It is left attached at five points corresponding to the detents or notches on the periphery of the washer, visible in Fig. 5. Carried by these points, the blank proceeds to the final blanking stations. Here these detents are cut. The punch then pushes the blank through the die to the stacking rods.

Lack of space prevents placing the blanking stations immediately adjacent to the compound stations. In each row, they are separated by two inactive stations, which are piloted in the splined hole. In view of the many movements and high precision required in this die, the piloting is of prime importance. The distance between all stations must be the same within close limits.

It would be practically impossible to produce a quadruple die like this by conventional transfer methods. They would have to be "one at a time" dies. For the required production, forty dies and forty presses would be needed, instead of the ten used. This die is possible today mainly because accurate hole location can be more easily obtained by the use of the machines described. Even if sufficient error could be tolerated to accept the hardening distortion in a quadruple die, the transfer of

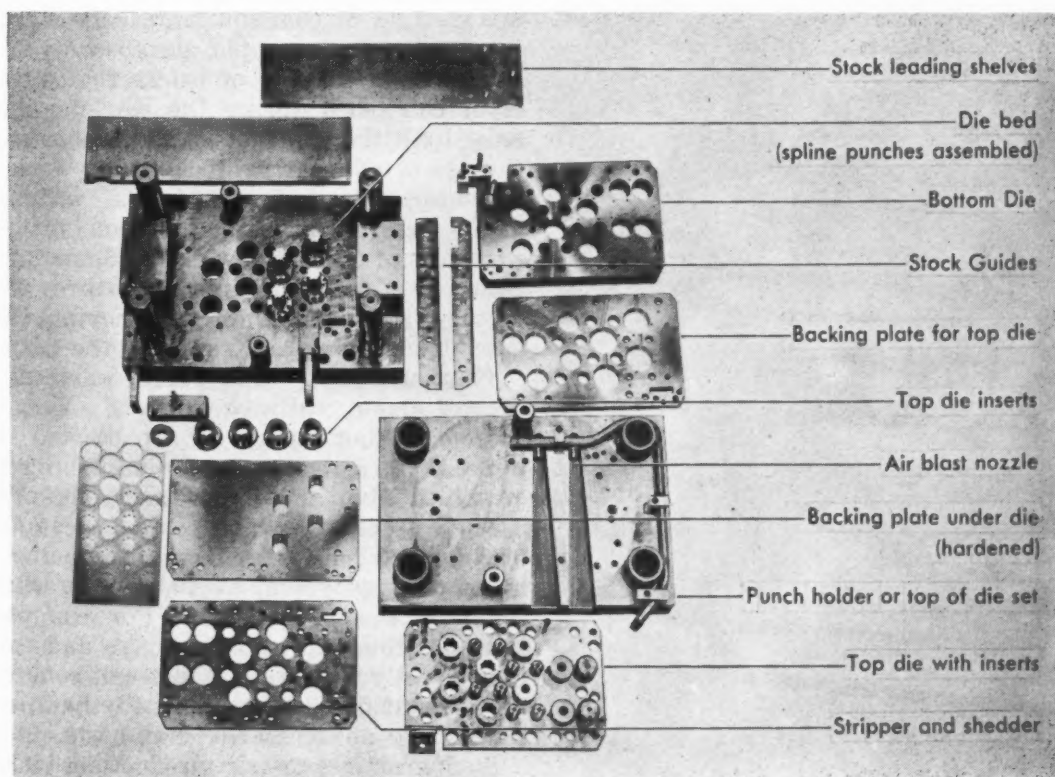


Fig. 4. Quadruple Die that Combines Compound and Progressive Features

the holes with their errors back through the hardened die into the other plates would consume the best part of three thousand man-hours of labor for one die. Since parts could only be made progressively, the job would be in the one-man class, and the die would require at least a year to build.

Actually, the first of these dies was finished in three months. Ten were delivered five months after receipt of the order. The reason for this is that all parts were made to exact dimensions, including the dowel-holes in the compound station inserts. Even the detents in the final blanking punches were jig-ground. These detents were inserted round pieces, set into jig-ground holes.

Dies for electrical lamination stampings, such as the one shown in Fig. 6, present a major problem with regard to length of life. The stock to be cut is usually thin and of an abrasive nature. Clearances between the punches and dies must be small and uniform. The laminations must be strictly interchangeable, and are usually made in large quantities. Die life, therefore, is a vital factor in the cost of the stampings. Dies for these jobs are generally made from special wear-resistant steel, and are ground all over to remove scale and decarburization, in order to maintain hard and sharp cutting edges.

Special production tools and dies represent a large proportion of management's investment in its enterprise. Management is, therefore, anxious

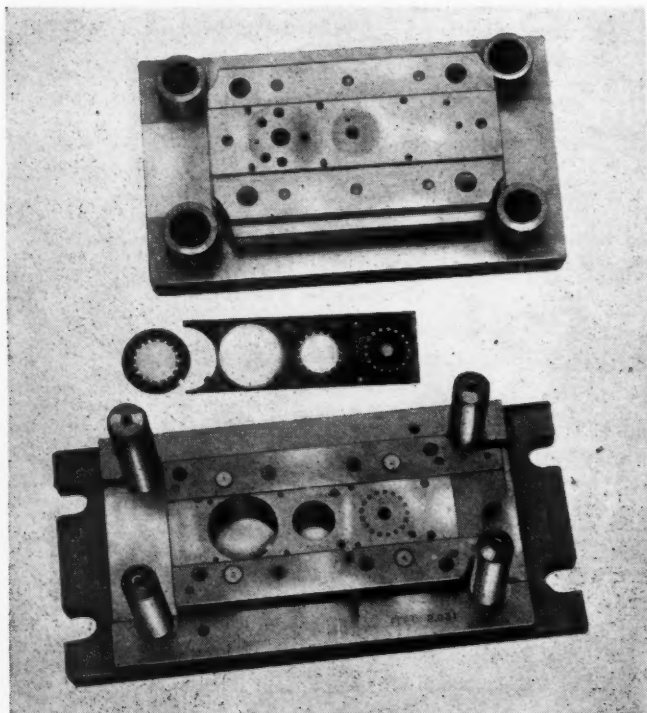


Fig. 6. Die for Stamping the Electrical Lamination Shown with its Scrap between the Die Parts

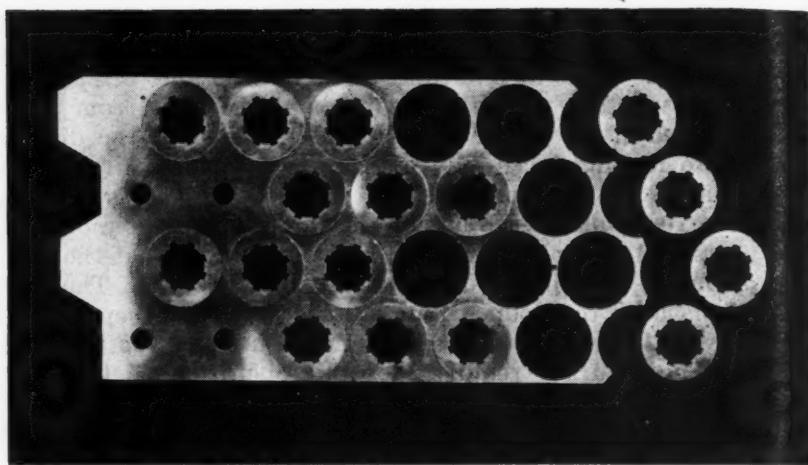


Fig. 5. Splined Washers and Scrap Produced by the Quadruple Die Shown in Fig. 4

to see the results from its expenditure delivered in the shortest possible time and in the best condition. Dividends are measured in terms of the length of life and number of parts produced. The soundness of the investment is a direct reflection of the excellence of workmanship, accuracy, and choice of materials. [J. R. Moore, the author of this article, is also the author of a forthcoming book "Precision Hole-Location for Interchangeability in Toolmaking and Production."—EDITOR]

* * *

Restrictive Union Rules Reduce Employment

The restrictive practices of many labor unions are matters of common knowledge. In the building trades, for example, an absurdly low limit is set upon the number of bricks that a union bricklayer can place during the working day. Union rules limit the width of paint brushes and prohibit the use of efficient paint spraying devices. When union pipe-fitters receive pipes machine-threaded at the factory, they often insist on cutting off those threads and cutting new ones. Some union electricians, upon receiving lighting fixtures wired at the factory, squander time by removing the factory-assembled wiring and rewiring the fixtures.

Featherbedding and other wasteful practices prevail among railway workers. Very generally, the older labor unions have restricted training of apprentices as a means of diminishing the supply of skilled labor and of increasing the money wage.

Such practices, which could be catalogued endlessly, have had the effect of reducing the man-hours of employment available to working groups indulging in such practices. For example, restrictive rules followed by bricklayers and stonemasons have greatly accelerated the use of concrete. Again, the amount of building generally has been greatly reduced by unnecessarily high costs.

Such practices restrict production, increase costs, limit the buying power of consumers, and reduce employment.—*Louis Ruthenburg*

Automatic Set-Up for Broaching Clutch Disk Teeth

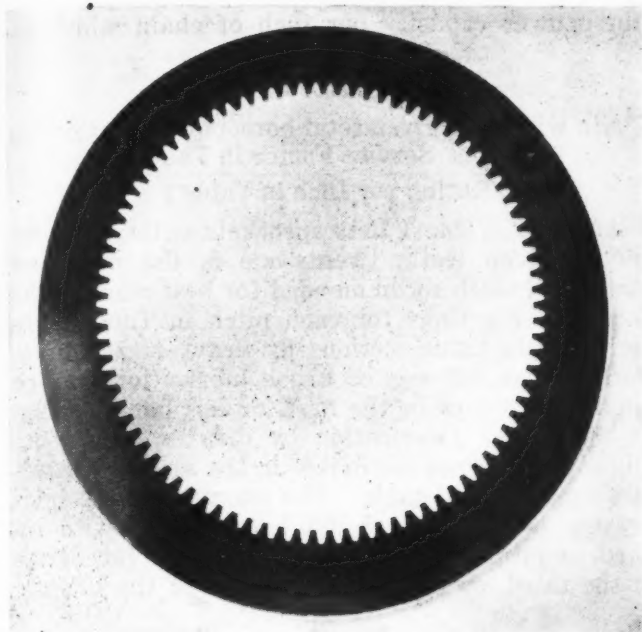


Fig. 1. Clutch Disk with 120 Involute Teeth Broached by Set-up Shown in Fig. 2

AUTOMATIC broaching set-ups using relatively simple broaches can often be designed to broach complex parts with considerable savings in production costs. In the example here illustrated, the involute internal teeth of thirteen heavy-duty clutch disks are finish-machined in twelve strokes of an automatic broaching operation. This set-up was designed and installed for a manufacturer of agricultural equipment by the Colonial Broach Co., Detroit, Mich.

The clutch disk, shown in Fig. 1, has 120 involute internal teeth, and is made of mild steel, with an inside diameter of 14 inches and a thickness of 0.115 inch. Thirteen of these disks are stacked in the sliding fixture shown on the broaching machine in Fig. 2. Six different sizes of disks can be handled on this machine with one fixture by changing the adapter rings.

The power press used for this broaching operation is rated at 15 tons, and the cut is made by pushing the broach bar down past the work. The broach is made in six sections, and has a total length of 66 inches. A single stroke of 72 inches completes the machining of the full tooth depth on ten teeth. Each of the six broach sections is 4 inches wide. The sections are attached to the broach bar by a tongue and groove, and are locked in place from the back with screws. The broach bar, which is 5 inches wide and 3 inches thick, travels in close fitting guides placed both above and below the work to insure minimum deflection and prevent chatter.

After the fixture has been loaded and the starting button pushed, the machine completes an automatic work cycle as follows: The fixture automat-

ically moves into the working position; the ram carrying the broach completes its first stroke, cutting ten teeth; the fixture is moved to clear the broach on the up stroke; the fixture then moves further back and indexes for the next group of ten teeth; after the completion of eleven indexings and twelve strokes, the fixture moves forward for unloading, and the machine stops.

The former method of using internal shaping tools to cut the teeth in the clutch disks required from forty-five minutes to an hour to complete one load of thirteen disks. With the present broaching method, ten to twelve loads are produced per hour.

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Motion Picture on Meehanite Castings

A motion picture entitled "Meehanite Means Better Castings" has been produced by the Meehanite Metal Corporation, Pershing Square Bldg., New Rochelle, N. Y. The film is of an educational nature, and provides definite engineering facts about Meehanite castings, their types and applications. It is available for use by societies, groups, or companies without charge. Those interested can obtain further information from the Meehanite Metal Corporation at the address given above.



Fig. 2. Shuttle Type Fixture Mounted on Broaching Machine, which Holds Thirteen of the Clutch Disks Shown in Fig. 1

Horsepower Ratings for Silent Chain Drives

THE horsepower ratings for silent chain drives can be listed only for a uniform rate of work, where there is relatively little shock or load variation throughout a single revolution of a driven sprocket. This is the basis for the industrial standard horsepower ratings listed in Table 1. These ratings have been adopted as standard by the Association of Roller and Silent Chain Manufacturers.

Engineering judgment must be exercised in using these horsepower ratings with regard to the severity of the operating conditions that may be encountered with each installation. The source of power, the nature of the load, and the resulting effects of inertia, strain, and shock must be taken into consideration. Table 2 (see page 171), which gives recommended service factors for various sources of power and types of driven mechanisms, may be used as a guide in exercising this judgment. Allowance is made for the service conditions specified in Table 2 by the use of the following formulas:

$$\text{Horsepower capacity per inch of chain width} = \frac{\text{Rating in Table 1}}{\text{Service Factor in Table 2}}$$

$$\text{Chain width for given total horsepower capacity} = \frac{\text{H.P.} \times \text{Service Factor in Table 2}}{\text{Rating per Inch in Table 1}}$$

Although Table 1 lists sprockets with seventeen and nineteen teeth, twenty-one is the minimum number of teeth recommended for best results. The horsepower ratings for each pitch in Table 1 are divided into three sections by heavy zigzag lines. Bath, splash, oil-cup, or brush lubrication may be applied to drives in the first, or left-hand, section of the table. Lubrication by disk or circulating pump is preferred for drives in the second, or middle, section of the table. The manufacturer's engineering department should be consulted with regard to proper methods of lubrication for drives in the third, or right-hand, section of the table.

Table 1. Horsepower Ratings for Silent Chain Drives

3/8-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 4 Inches											
No. of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	500	1000	1500	2000	2500	3000	3500	4000	5000	6000
*17	.37	1.7	3.7	4.2	5.5	6.3	6.8	7.0	7.0	...	....
*19	.42	2.0	3.8	5.2	6.3	7.3	7.9	8.3	8.4	7.8	....
21	.46	2.2	4.1	5.8	7.2	8.3	9.1	9.6	9.9	9.5	8.2
23	.50	2.4	4.5	6.4	8.0	9.2	10	11	11	11	9.5
25	.55	2.6	4.9	7.0	8.8	10	11	12	12	12	11
27	.59	2.8	5.4	7.6	9.5	11	12	13	14	14	13
29	.64	3.0	5.8	8.2	10.3	12	13	14	15	15	14
31	.68	3.3	6.2	8.8	11	13	14	15	16	16	15
33	.72	3.5	6.6	9.4	12	14	15	17	17	17	16
35	.77	3.7	7.0	10	13	15	16	18	18	18	17
37	.82	3.9	7.3	11	13	16	17	19	19	19	....
40	.9	4.2	8.1	12	14	17	19	20	21	21	....
45	1.0	4.8	9.1	13	16	19	21	22	23	....	....
50	1.1	5.3	10	14	18	21	23	24	....	....	....
1/2-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 7 Inches											
No. of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	500	700	1000	1200	1800	2000	2500	3000	3500	4000
*17	.66	3	4	5	6	8	9	9	9	9	..
*19	.74	3	4	6	7	9	10	11	11	11	..
21	.81	4	5	7	8	11	11	12	13	13	..
23	.89	4	6	8	9	12	13	14	15	15	14
25	.97	4	6	8	10	13	14	16	17	17	16
27	1.0	5	7	9	10	14	15	17	19	19	18
29	1.1	5	7	10	11	15	17	19	20	20	20
31	1.2	6	8	10	12	17	18	20	22	22	22
33	1.3	6	8	11	13	18	19	22	23	24	23
35	1.4	6	9	12	14	19	20	23	25	25	24
37	1.5	7	9	13	15	20	21	24	26	26	..
40	1.6	7	10	14	16	22	23	26	28	28	..
45	2	8	11	15	18	24	24	29	31	..	..
50	2	9	12	17	20	27	29	32	..	..	..

*For best results, smaller sprocket should have at least 21 teeth.

Horsepower Ratings for Silent Chain Drives (Continued)

$\frac{3}{8}$ -inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 8 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket									
	100	500	700	1000	1200	1800	2000	2500	3000	3500
*19	1.1	5	7	10	11	13	14	14	..	..
21	1.3	6	8	10	12	15	16	16	16	..
23	1.4	6	9	12	13	17	18	19	18	..
25	1.5	7	9	13	15	19	20	21	21	19
27	1.6	8	10	14	16	21	22	23	23	21
29	1.7	8	11	15	17	22	24	25	25	23
31	1.9	9	12	16	18	24	25	27	27	25
33	2	9	13	17	20	26	27	29	29	27
35	2.1	10	13	18	21	27	29	31	31	28
37	2.2	10	14	19	22	29	31	34	33	..
40	2.4	11	15	21	24	31	33	35	..	..
45	2.7	13	17	23	27	35	37	..	..	..
50	3	14	19	26	30	38	40	..	..	..

$\frac{3}{4}$ -inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 10 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket								
	100	500	700	1000	1200	1500	1800	2000	2500
*19	1.6	7.4	10	12	14	16	17	17	..
21	1.8	8	11	14	16	18	19	20	19
23	2.0	9	12	16	18	20	22	22	22
25	2.2	10	13	17	20	23	25	25	24
27	2.3	11	14	19	22	25	27	28	28
29	2.5	12	16	21	24	27	29	30	30
31	2.7	12	17	22	25	29	32	33	33
33	2.9	13	18	24	27	31	34	35	35
35	3.0	14	19	25	29	33	36	37	37
37	3.2	15	20	27	31	35	38	39	39
40	3.5	16	22	29	33	38	41	42	42
45	3.9	18	24	32	37	42	45	46	..
50	4.3	20	27	36	41	46	49	..	..

1-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 14 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	200	300	400	500	700	1000	1200	1500	1800	2000
*19	3	6	8	10	12	16	20	21	22	..	..
21	3	6	9	12	14	18	23	25	26	26	..
23	3	7	10	13	15	20	25	28	30	30	..
25	4	7	11	14	17	22	28	31	33	33	33
27	4	8	12	15	19	24	31	34	37	37	36
29	4	9	13	16	20	26	33	37	40	41	40
31	5	9	13	18	22	28	36	40	43	44	43
33	5	10	14	19	23	30	39	43	47	47	46
35	5	10	15	20	24	32	41	45	49	50	49
37	5.4	11	16	21	26	34	43	48	52	53	..
40	6	12	18	23	28	36	47	52	56	..	..
45	7	13	20	25	31	41	52	57	61	..	..
50	8	15	22	28	34	45	57	62	..	..	..

*For best results, smaller sprocket should have at least 21 teeth.

the holes with their errors back through the hardened die into the other plates would consume the best part of three thousand man-hours of labor for one die. Since parts could only be made progressively, the job would be in the one-man class, and the die would require at least a year to build.

Actually, the first of these dies was finished in three months. Ten were delivered five months after receipt of the order. The reason for this is that all parts were made to exact dimensions, including the dowel-holes in the compound station inserts. Even the detents in the final blanking punches were jig-ground. These detents were inserted round pieces, set into jig-ground holes.

Dies for electrical lamination stampings, such as the one shown in Fig. 6, present a major problem with regard to length of life. The stock to be cut is usually thin and of an abrasive nature. Clearances between the punches and dies must be small and uniform. The laminations must be strictly interchangeable, and are usually made in large quantities. Die life, therefore, is a vital factor in the cost of the stampings. Dies for these jobs are generally made from special wear-resistant steel, and are ground all over to remove scale and decarburization, in order to maintain hard and sharp cutting edges.

Special production tools and dies represent a large proportion of management's investment in its enterprise. Management is, therefore, anxious

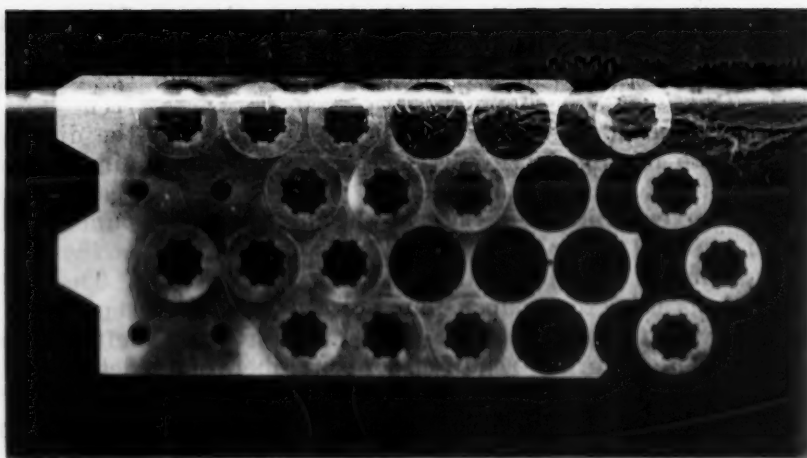


Fig. 5. Splined Washers and Scrap Produced by the Quadruple Die Shown in Fig. 4

to see the results from its expenditure delivered in the shortest possible time and in the best condition. Dividends are measured in terms of the length of life and number of parts produced. The soundness of the investment is a direct reflection of the excellence of workmanship, accuracy, and choice of materials. [J. R. Moore, the author of this article, is also the author of a forthcoming book "Precision Hole-Location for Interchangeability in Toolmaking and Production."—EDITOR]

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Restrictive Union Rules Reduce Employment

The restrictive practices of many labor unions are matters of common knowledge. In the building trades, for example, an absurdly low limit is set upon the number of bricks that a union bricklayer can place during the working day. Union rules limit the width of paint brushes and prohibit the use of efficient paint spraying devices. When union pipe-fitters receive pipes machine-threaded at the factory, they often insist on cutting off those threads and cutting new ones. Some union electricians, upon receiving lighting fixtures wired at the factory, squander time by removing the factory-assembled wiring and rewiring the fixtures.

Featherbedding and other wasteful practices prevail among railway workers. Very generally, the older labor unions have restricted training of apprentices as a means of diminishing the supply of skilled labor and of increasing the money wage.

Such practices, which could be catalogued endlessly, have had the effect of reducing the man-hours of employment available to working groups indulging in such practices. For example, restrictive rules followed by bricklayers and stonemasons have greatly accelerated the use of concrete. Again, the amount of building generally has been greatly reduced by unnecessarily high costs.

Such practices restrict production, increase costs, limit the buying power of consumers, and reduce employment.—*Louis Ruthenburg*

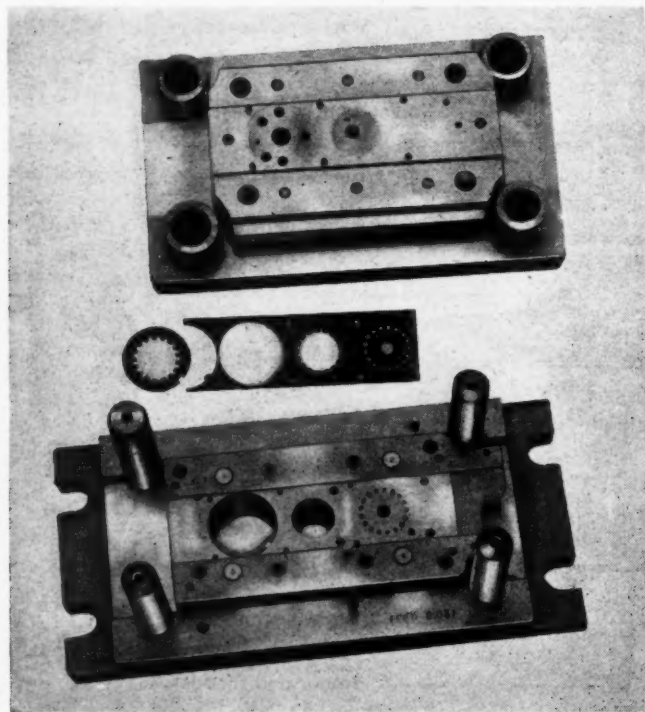


Fig. 6. Die for Stamping the Electrical Lamination Shown with its Scrap between the Die Parts

Automatic Set-Up for Broaching Clutch Disk Teeth

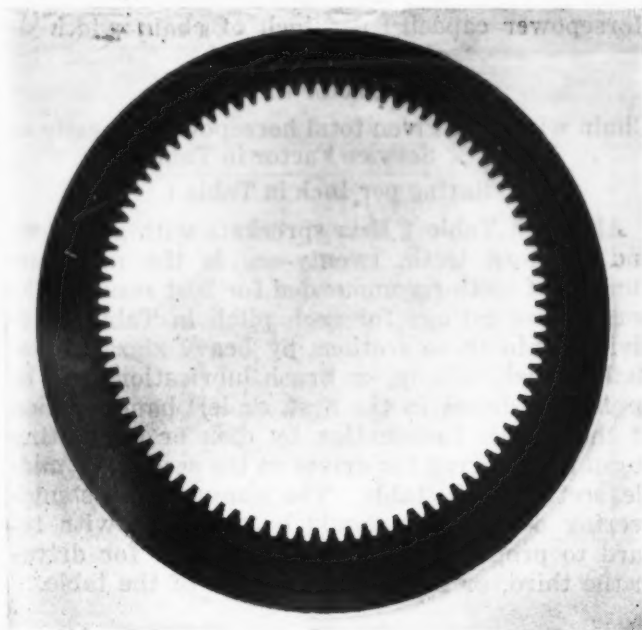


Fig. 1. Clutch Disk with 120 Involute Teeth Broached by Set-up Shown in Fig. 2

AUTOMATIC broaching set-ups using relatively simple broaches can often be designed to broach complex parts with considerable savings in production costs. In the example here illustrated, the involute internal teeth of thirteen heavy-duty clutch disks are finish-machined in twelve strokes of an automatic broaching operation. This set-up was designed and installed for a manufacturer of agricultural equipment by the Colonial Broach Co., Detroit, Mich.

The clutch disk, shown in Fig. 1, has 120 involute internal teeth, and is made of mild steel, with an inside diameter of 14 inches and a thickness of 0.115 inch. Thirteen of these disks are stacked in the sliding fixture shown on the broaching machine in Fig. 2. Six different sizes of disks can be handled on this machine with one fixture by changing the adapter rings.

The power press used for this broaching operation is rated at 15 tons, and the cut is made by pushing the broach bar down past the work. The broach is made in six sections, and has a total length of 66 inches. A single stroke of 72 inches completes the machining of the full tooth depth on ten teeth. Each of the six broach sections is 4 inches wide. The sections are attached to the broach bar by a tongue and groove, and are locked in place from the back with screws. The broach bar, which is 5 inches wide and 3 inches thick, travels in close fitting guides placed both above and below the work to insure minimum deflection and prevent chatter.

After the fixture has been loaded and the starting button pushed, the machine completes an automatic work cycle as follows: The fixture automat-

ically moves into the working position; the ram carrying the broach completes its first stroke, cutting ten teeth; the fixture is moved to clear the broach on the up stroke; the fixture then moves further back and indexes for the next group of ten teeth; after the completion of eleven indexings and twelve strokes, the fixture moves forward for unloading, and the machine stops.

The former method of using internal shaping tools to cut the teeth in the clutch disks required from forty-five minutes to an hour to complete one load of thirteen disks. With the present broaching method, ten to twelve loads are produced per hour.

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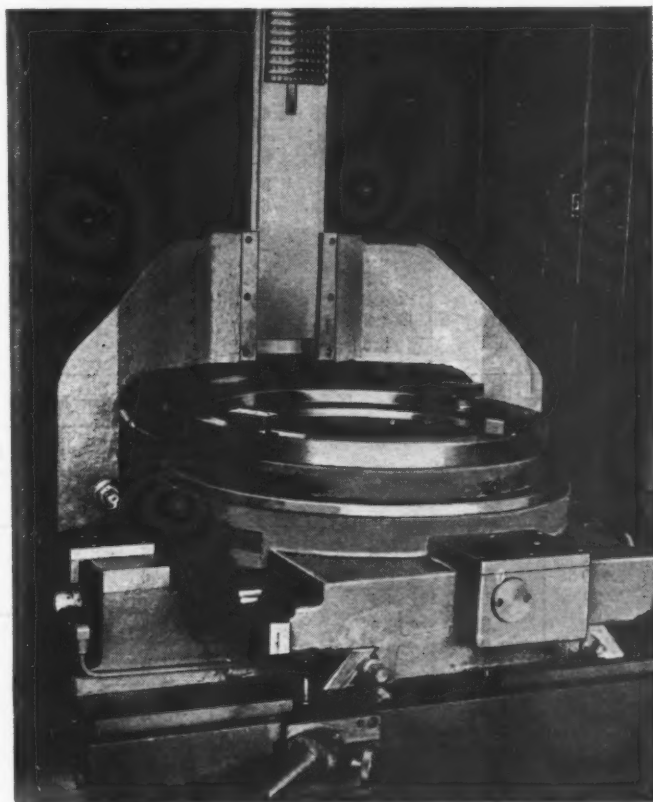


Fig. 2. Shuttle Type Fixture Mounted on Broaching Machine, which Holds Thirteen of the Clutch Disks Shown in Fig. 1

Horsepower Ratings for Silent Chain Drives

THE horsepower ratings for silent chain drives can be listed only for a uniform rate of work, where there is relatively little shock or load variation throughout a single revolution of a driven sprocket. This is the basis for the industrial standard horsepower ratings listed in Table 1. These ratings have been adopted as standard by the Association of Roller and Silent Chain Manufacturers.

Engineering judgment must be exercised in using these horsepower ratings with regard to the severity of the operating conditions that may be encountered with each installation. The source of power, the nature of the load, and the resulting effects of inertia, strain, and shock must be taken into consideration. Table 2 (see page 171), which gives recommended service factors for various sources of power and types of driven mechanisms, may be used as a guide in exercising this judgment. Allowance is made for the service conditions specified in Table 2 by the use of the following formulas:

Horsepower capacity per inch of chain width =
Rating in Table 1

Service Factor in Table 2

Chain width for given total horsepower capacity =
H.P. \times Service Factor in Table 2

Rating per Inch in Table 1

Although Table 1 lists sprockets with seventeen and nineteen teeth, twenty-one is the minimum number of teeth recommended for best results. The horsepower ratings for each pitch in Table 1 are divided into three sections by heavy zigzag lines. Bath, splash, oil-cup, or brush lubrication may be applied to drives in the first, or left-hand, section of the table. Lubrication by disk or circulating pump is preferred for drives in the second, or middle, section of the table. The manufacturer's engineering department should be consulted with regard to proper methods of lubrication for drives in the third, or right-hand, section of the table.

Table 1. Horsepower Ratings for Silent Chain Drives

3/8-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 4 Inches											
No. of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	500	1000	1500	2000	2500	3000	3500	4000	5000	6000
*17	.37	1.7	3.7	4.2	5.5	6.3	6.8	7.0	7.0	...	....
*19	.42	2.0	3.8	5.2	6.3	7.3	7.9	8.3	8.4	7.8	....
21	.46	2.2	4.1	5.8	7.2	8.3	9.1	9.6	9.9	9.5	8.2
23	.50	2.4	4.5	6.4	8.0	9.2	10	11	11	11	9.5
25	.55	2.6	4.9	7.0	8.8	10	11	12	12	12	11
27	.59	2.8	5.4	7.6	9.5	11	12	13	14	14	13
29	.64	3.0	5.8	8.2	10.3	12	13	14	15	15	14
31	.68	3.3	6.2	8.8	11	13	14	15	16	16	15
33	.72	3.5	6.6	9.4	12	14	15	17	17	17	16
35	.77	3.7	7.0	10	13	15	16	18	18	18	17
37	.82	3.9	7.3	11	13	16	17	19	19	19	....
40	.9	4.2	8.1	12	14	17	19	20	21	21	....
45	1.0	4.8	9.1	13	16	19	21	22	23	....	....
50	1.1	5.3	10	14	18	21	23	24	....	....	....
1/2-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 7 Inches											
No. of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	500	700	1000	1200	1800	2000	2500	3000	3500	4000
*17	.66	3	4	5	6	8	9	9	9	9	..
*19	.74	3	4	6	7	9	10	11	11	11	..
21	.81	4	5	7	8	11	11	12	13	13	..
23	.89	4	6	8	9	12	13	14	15	15	14
25	.97	4	6	8	10	13	14	16	17	17	16
27	1.0	5	7	9	10	14	15	17	19	19	18
29	1.1	5	7	10	11	15	17	19	20	20	20
31	1.2	6	8	10	12	17	18	20	22	22	22
33	1.3	6	8	11	13	18	19	22	23	24	23
35	1.4	6	9	12	14	19	20	23	25	25	24
37	1.5	7	9	13	15	20	21	24	26	26	..
40	1.6	7	10	14	16	22	23	26	28	28	..
45	2	8	11	15	18	24	24	29	31	..	..
50	2	9	12	17	20	27	29	32	..	..	..

*For best results, smaller sprocket should have at least 21 teeth.

Horsepower Ratings for Silent Chain Drives (Continued)

$\frac{3}{4}$ -inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 8 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket									
	100	500	700	1000	1200	1800	2000	2500	3000	3500
*19	1.1	5	7	10	11	13	14	14	..	..
21	1.3	6	8	10	12	15	16	16	16	..
23	1.4	6	9	12	13	17	18	19	18	..
25	1.5	7	9	13	15	19	20	21	21	19
27	1.6	8	10	14	16	21	22	23	23	21
29	1.7	8	11	15	17	22	24	25	25	23
31	1.9	9	12	16	18	24	25	27	27	25
33	2	9	13	17	20	26	27	29	29	27
35	2.1	10	13	18	21	27	29	31	31	28
37	2.2	10	14	19	22	29	31	34	33	..
40	2.4	11	15	21	24	31	33	35	..	..
45	2.7	13	17	23	27	35	37	..	..	..
50	3	14	19	26	30	38	40	..	..	..

$\frac{3}{4}$ -inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 10 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket									
	100	500	700	1000	1200	1500	1800	2000	2500	
*19	1.6	7.4	10	12	14	16	17	17	..	
21	1.8	8	11	14	16	18	19	20	19	
23	2.0	9	12	16	18	20	22	22	22	
25	2.2	10	13	17	20	23	25	25	24	
27	2.3	11	14	19	22	25	27	28	28	
29	2.5	12	16	21	24	27	29	30	30	
31	2.7	12	17	22	25	29	32	33	33	
33	2.9	13	18	24	27	31	34	35	35	
35	3.0	14	19	25	29	33	36	37	37	
37	3.2	15	20	27	31	35	38	39	39	
40	3.5	16	22	29	33	38	41	42	42	
45	3.9	18	24	32	37	42	45	46	..	
50	4.3	20	27	36	41	46	49	..	..

1-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 14 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	200	300	400	500	700	1000	1200	1500	1800	2000
*19	3	6	8	10	12	16	20	21	22	..	..
21	3	6	9	12	14	18	23	25	26	26	..
23	3	7	10	13	15	20	25	28	30	30	..
25	4	7	11	14	17	22	28	31	33	33	33
27	4	8	12	15	19	24	31	34	37	37	36
29	4	9	13	16	20	26	33	37	40	41	40
31	5	9	13	18	22	28	36	40	43	44	43
33	5	10	14	19	23	30	39	43	47	47	46
35	5	10	15	20	24	32	41	45	49	50	49
37	5.4	11	16	21	26	34	43	48	52	53	..
40	6	12	18	23	28	36	47	52	56	..	..
45	7	13	20	25	31	41	52	57	61	..	..
50	8	15	22	28	34	45	57	62	..	..	..

*For best results, smaller sprocket should have at least 21 teeth.

Horsepower Ratings for Silent Chain Drives (Continued)

1¼-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 20 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	200	300	400	500	600	700	800	1000	1200	1500
*19	4.5	8	12	16	19	21	23	25	27	28	..
21	5	9	14	18	21	24	26	29	32	33	..
23	5.5	10	15	19	23	27	29	32	36	37	37
25	6	11	16	21	25	29	32	35	40	42	42
27	6.4	12	18	23	28	32	35	39	43	46	46
29	6.9	13	19	25	30	34	38	42	47	50	51
31	7.4	14	21	27	32	37	41	45	51	54	55
33	7.9	15	22	28	34	39	44	48	55	58	59
35	8.4	16	23	30	36	42	47	51	58	62	62
37	9	17	24	32	38	44	50	54	61	65	..
40	9.6	19	27	35	42	48	54	59	66	70	..
45	10.7	21	30	39	47	54	60	65	73	..	..
50	12	23	34	43	52	59	66	72	80	..	..

1½-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 24 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket										
	100	200	300	400	500	600	700	800	900	1000	1200
*19	6.4	12	17	22	25	28	31	32	33	34	..
21	7	13	19	24	29	32	35	37	39	39	..
23	8	15	21	27	32	36	39	42	44	45	44
25	8	16	23	30	35	40	44	47	49	52	51
27	9	18	25	32	38	43	48	51	54	56	56
29	10	19	27	35	41	47	52	56	59	60	61
31	11	20	29	37	44	51	56	60	63	65	66
33	11	22	31	40	47	54	60	64	68	70	71
35	12	23	33	42	50	57	63	68	72	74	75
37	13	24	35	47	53	61	67	72	77	79	..
40	14	26	38	53	58	66	72	78	84	..	..
45	15	30	43	54	65	74	81	86	90	..	..
50	17	33	47	60	71	81	89	94	..	..	..

2-inch Pitch—Horsepower per Inch of Chain Width—Maximum Width, 30 Inches

Number of Teeth in Small Sprocket	Revolutions per Minute—Small Sprocket									
	100	200	300	400	500	600	700	800	900	
*19	11	21	29	35	40	43	45	..	..
21	12.5	23	32	40	42	50	52	..	..
23	13.5	26	36	44	51	56	59	60	..	
25	14	28	39	49	56	62	66	68	68	
27	16	30	43	53	62	68	73	75	75	
29	17	33	46	58	67	74	79	82	82	
31	18	35	50	62	72	80	85	88	88	
33	20	37	53	66	77	85	91	94	94	
35	21	40	57	70	82	91	97	100	100	
37	22	42	60	74	88	99	102	105	..	
40	24	46	65	81	94	103	110	113	..	
45	27	51	72	90	105	115	121	..	..
50	30	57	80	100	115	125	..	..	..

*For best results, smaller sprocket should have at least 21 teeth.

Table 2. Service Factors for Silent Chain Drives

Use factors in Column 1 for service of 10 hours per day. Use factors in Column 2 for service of 24 hours per day or when extra long chain life is desired.								
Driven Machine	Source of Power							
	Electric Motor or Turbine of Equal Rating		Over-size Motor or Turbine or Steam Engine*		Gasoline Engine 6 to 12 Cylinders		4-cylinder Gas Engine or Diesel	
	Col. 1	Col. 2	Col. 1	Col. 2	Col. 1	Col. 2	Col. 1	Col. 2
Agitators								
Liquid	1.1	1.3	1.2	1.5	1.4	1.7	1.6	1.9
Semi-liquid	1.1	1.3	1.2	1.5	1.4	1.7	1.6	1.9
Brick-Clay Mach.								
Auger Machines	1.3	1.6	1.4	1.7	1.5	1.8	1.7	2
Brick Machines	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Cutting Table	1.3	1.6	1.4	1.7	1.5	1.8	1.7	2
Dry Press	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Granulator	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Mixer	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Rolls	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Cement Plants								
Kilns	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Kominuters	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Compressors, Recip.								
Gas	1.4	1.7	1.5	1.8	1.6	1.9	.....	.....
Liquid	1.5	1.8	1.6	1.9	1.7	2	.....	.....
Cotton-Oil Plants								
Linters	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Cookers	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Cranes	1	1.3	1.2	1.5	1.4	1.7	1.8	2.2
Crushing Machinery								
Ball Mills	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Coal Breakers	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Coal Pulverizers	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Cone Crushers	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Crushing Rolls	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Gvratory Crushers	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Hardinge Mills	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Jaw Crushers	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Linseed Crushers	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Fans, Blowers								
Exhausters	1.2	1.5	1.4	1.7	1.6	1.9	1.8	2.2
Fans (Misc.)	1.1	1.4	1.3	1.6	1.6	1.9	1.8	2.2
Mine Fans	1.3	1.6	1.5	1.8	1.7	2	2	2.5
Positive Blowers	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Propeller	1.1	1.4	1.3	1.6	1.6	1.9	1.8	2.2
Flour, Feed, Cereal Machines								
Bolters, Sifters	1.1	1.4	1.2	1.5	1.3	1.6	1.5	1.8
Grinders	1.2	1.5	1.3	1.6	1.4	1.7	1.6	1.9
Purifiers, Reels	1.1	1.4	1.2	1.5	1.3	1.6	1.5	1.8
Roller Mills	1.3	1.6	1.4	1.7	1.5	1.8	1.7	2
Separator	1.1	1.4	.....	.....	.....	.....	.....	.....
Generators, Exciters	1.2	1.5	1.3	1.6	1.4	1.7	1.6	1.9
Hoists	1	1.3	1.2	1.5	1.3	1.6	1.5	1.8
Ice Machines	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Laundry Machinery								
Dampeners	1.1	1.4	1.2	1.5	1.4	1.7	1.6	1.9
Extractors	1.1	1.4	1.2	1.5	1.4	1.7	1.6	1.9
Tumblers	1.2	1.5	1.3	1.6	1.4	1.7	1.6	1.9
Washers	1.1	1.4	1.2	1.5	1.4	1.7	1.6	1.9
Lineshafts								
Brick Plants	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Coal Handling	1.2	1.5	1.3	1.6	1.4	1.7	1.5	1.8
Cotton Gins	1.1	1.4	1.2	1.5	1.3	1.6	1.5	1.8
Cotton Oil Plants	1.1	1.4	1.2	1.5	1.3	1.6	1.5	1.8
Lineshafts (Cont.)								
Grain Elevators	1	1.3	1.1	1.4	1.2	1.5	1.4	1.7
Paper Mills	1.3	1.6	1.4	1.7	1.5	1.8	1.7	2
Rubber Plants	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Steel Mills	1.4	1.7	1.5	1.8	1.6	1.9	1.8	2.2
Machine Tools								
Boring Mills	1	1.3	1.2	1.5	1.4	1.7	.....	.....
Cam Cutters	1	1.3	1.2	1.5	1.4	1.7	.....	.....
Punch Presses	1.2	1.5	1.4	1.7	1.5	1.8	.....	.....
Drill Presses	1	1.3	1.1	1.4	1.3	1.6	.....	.....
Grinders	1.1	1.4	1.2	1.5	1.4	1.7	.....	.....
Lathes	1	1.3	1.2	1.5	1.4	1.7	.....	.....
Milling Machines	1.1	1.4	1.3	1.6	1.5	1.8	.....	.....
Mills								
Ball	1.6	1.9	1.7	2	1.8	2.2	.....	.....
Flaking	1.6	1.9	1.7	2	1.8	2.2	.....	.....
Pebble	1.6	1.9	1.7	2	1.8	2.2	.....	.....
Rod	1.6	1.9	1.7	2	1.8	2.2	.....	.....
Roller	1.6	1.9	1.7	2	1.8	2.2	.....	.....
Hardinge	1.6	1.9	1.7	2	1.8	2.2	.....	.....
Oil Field Machinery								
Pipe-line Pumps	1.1	1.4	1.3	1.6	1.4	1.7	1.5	1.8
Pumping Units	1.4	1.7	1.5	1.8	1.6	1.9	1.7	2
Slush Pumps	1.3	1.6	1.4	1.7	1.5	1.8	1.6	1.9
Paper Machinery								
Agitators	1	1.3	1.2	1.5	1.3	1.6	1.5	1.8
Beaters	1.3	1.6	1.5	1.8	1.6	1.9	1.7	2
Calenders	1.2	1.5	1.4	1.7	1.5	1.8	1.6	1.9
Chippers	1.5	1.8	1.6	1.9	1.7	2	1.8	2.2
Dryers	1.2	1.5	1.4	1.7	1.5	1.8	1.6	1.9
Paper Machines	1.2	1.5	1.3	1.6	1.5	1.8	1.6	1.9
Washers	1.4	1.7	.....	.....	.....	.....	.....	.....
Winder Drums	1.5	1.8	1.6	1.9	1.7	2	.....	.....
Printing Machinery								
Embossing Press	1.2	1.5	1.3	1.6	1.5	1.8	1.6	1.9
Flat-bed Press	1.2	1.5	1.3	1.6	1.5	1.8	1.6	1.9
Folders	1.2	1.5	1.3	1.6	1.5	1.8	1.6	1.9
Linotype	1.1	1.4	1.2	1.5	1.3	1.6	1.5	1.8
Magazine Presses	1.2	1.5	1.4	1.7	1.5	1.8	1.6	1.9
Newspaper Presses	1	1.3	1.2	1.5	1.3	1.6	1.4	1.7
Paper Cutters	1.1	1.4	1.2	1.5	1.3	1.6	1.5	1.8
Rotary Press	1.1	1.4	1.2	1.5	1.3	1.6	1.5	1.8
Pumps								
Centrifugal	1.1	1.4	1.3	1.6	1.5	1.8	1.6	1.9
Dredge	1.5	1.8	1.6	1.9	1.7	2	2	2.5
Duplex	1.6	1.9	1.7	2	1.8	2.2	2	2.5
Gear	1.2	1.5	1.3	1.6	1.5	1.8	1.6	1.9
Rotary	1.1	1.4	1.3	1.6	1.5	1.8	1.6	1.9
Triplex	1.3	1.6	1.4	1.7	1.5	1.8	1.7	2
Steel Plants								
Rolling Mills	1.3	1.6	1.4	1.7	1.5	1.8	1.7	2
Wire Benches	1.2	1.5	1.3	1.6	1.5	1.8	1.6	1.9
Textile Machinery								
Looms	1.1	1.4	1.3	1.6	.....	.....	.....	.....
Reels	1	1.3	1.2	1.5	.....	.....	.....	.....
Spinning Frames	1	1.3	1.2	1.5	.....	.....	.....	.....
Twisters	1	1.3	1.2	1.5	.....	.....	.....	.....
Warpers	1	1.3	1.2	1.5	.....	.....	.....	.....

*These factors also apply to gas or Diesel engines with hydraulic drive.

Deburring Operation Speeded 400 Per Cent by Power Brushing

A power brushing technique used by the Marlin-Rockwell Corporation in connection with the deburring and removal of sharp edges around drilled holes in ball bearing separators is said to have speeded up the operation 400 per cent, as compared with the former hand method of using sandpaper and files. The new method permits the deburring

of several separators in one operation, and does the work on both inside and outside diameters at the same time. For the outside diameter work, 10-inch diameter steel wire brush sections, made by the Osborn Mfg. Co., Cleveland, Ohio, are used, operating at a speed of 1800 R.P.M. on a double-spindle polishing lathe. Four of these steel wire sections are mounted together for this part of the operation. The inside diameter operation is accomplished by using several brush sections on a steel fixture.

Engineering News

Kaiser Car Embodies Important Engineering Developments

The Kaiser-Frazer Corporation's car, the Kaiser, will be a six-passenger automobile having a 117-inch wheel-base. One of the outstanding features will be the front wheel drive. It will be driven by a six-cylinder 85-H.P. engine. The engine, clutch, transmission, and final drive assembly are combined to form a "packaged power unit," which can be lifted clear of the integral body and frame for servicing. The engine is placed ahead of the front driving axle to maintain a more constant center of gravity, which is said to result in better traction.

Independent "torsionetic" suspension on all four wheels is another feature of the car. Independent spring action is provided for each wheel through a spindle, supporting arm, and torsion-bar spring. The spring motion is achieved through the twisting action of the heat-treated steel bar. Hydraulic shock absorbers are also included in this assembly. A monocoque type of single unit body and chassis construction is said to eliminate strain, shifting between the body and frame, and body squeaks.

Single-Unit Diesel Locomotive of 3000 Horsepower

The most powerful Diesel-electric locomotive ever built in one unit has been manufactured by the Baldwin Locomotive Works, Eddystone, Pa., for the Seaboard Air Line Railway. It will be used for heavy, fast freight runs, to carry fresh fruits and vegetables from Florida to northern markets.

Three thousand horsepower is generated by two

supercharged engines in one cab. The locomotive will be restricted to a speed of 85 miles per hour, although it will be capable of a speed of 120 miles per hour. The advantages claimed for having all the power in one unit are that the over-all length of the locomotive is reduced, and there is less weight on each wheel.

The locomotive has twelve axles, eight of which are motor-driven. The use of turbo-superchargers increases the normal 1000 H.P. of each eight-cylinder Diesel engine by more than 500 H.P. The locomotive will carry 3500 gallons of fuel oil, 300 gallons of lubricating oil, 600 gallons of engine cooling water, and 2500 gallons of boiler water for train heating when used to haul passenger trains.

Approach-Angle Indicator for Airports

An approach-angle indicator for airport landing which uses only a 100-watt incandescent bulb to project a tri-color beam over a one-mile range, thus indicating the correct angle of approach, has been developed by the Westinghouse Electric Corporation, Pittsburgh, Pa.

The indicator sends the light through seven lenses, breaking it up into green, red, and amber beams. The green beam indicates the correct angle of approach; the red, or lowest layer, warns the pilot that he is too low; and the yellow, or upper, beam warns the pilot that he is too high. To avoid possibility of glare and confusion with other lights, the beams flash on for one second and then off for one-half second. The flashing is controlled by a motor-driven shutter to insure sharp cut-off.



3000 - H.P. Diesel - electric Locomotive, Built by the Baldwin Locomotive Works for the Seaboard Air Line Railway, which is Said to be the Most Powerful Diesel-electric Locomotive in the World. This Locomotive Has One-third More Power than has Ever before been Placed in One Cab of a Diesel Locomotive

In clear weather, the approach-angle indicator is dimmed with the contact lights, being controlled by the same brightness control units. In low visibility, the candlepower is sufficient to impart an unmistakable signal to the pilot under any conditions where the contact lights are of use. For larger airports, a 240-watt lamp is available, with a range of about three miles at night.

Electronic Fuse Explodes Shell Near Target

The Navy Department recently revealed that "Madame X" was the name used for a proximity fuse that explodes shells near the target. The fuse was produced in large quantities at the RCA Victor plant in Camden, N. J. Assembly of the fuses was carried on in a 50,000 square foot area, which was air-conditioned by the York Corporation to maintain less than 50 per cent relative humidity, because undue moisture could make certain critical electrical and radio components of the fuses inoperative. In the final assembly, molten wax was poured over all open parts of the fuse unit.

The fuse is a miniature radar type of sending and receiving radio station, no larger than a pint milk bottle, which operates within the shell after it is fired from the gun. When the projectile is fired, the fuse emits radio waves that bounce against the target, are reflected back, and are picked up by the receiver. As the shell approaches the target, the reflected signal grows stronger, and finally, when the returning signal is sufficiently strong, the projectile is detonated by the fuse. "Madame X" was most effective in anti-aircraft defense, according to officials, and the fuse is credited with being an effective counter-measure against the Nazi buzz bomb.

Automobile Engine for Small Cars Characterized by Light Weight

The new Crosley automobile engine, hardly bigger or heavier than a standard typewriting machine, is powerful enough to drive a 1000-pound car at 60 miles an hour, and is remarkably low in gasoline consumption. The new engine weighs only 59 pounds, produces 26 H.P., and when installed in the proposed new 1000-pound Crosley car, will give unusually economical performance.

The new engine is described as built on a radically new principle from sheet-steel stampings instead of from heavy forgings and castings. The cylinder walls are made from chromium-molybdenum steel, and are only 1/16 inch thick. The engine parts are stamped from thin metal sheets and tubes, crimped together, and brazed into a single piece by copper brazing. At a speed of 35 miles per hour, it is said that a gallon of gasoline will drive the new car for a distance of 50 miles, and at 55 miles per hour the fuel consumption will not exceed 1 gallon for 35 miles.



Airplane Tire being Examined after Test on Dynamometer

Airplane Tire Testing Machine Simulates Actual Landing Conditions

A dynamometer having a weight of 250 tons is employed by Army Air Force engineers at Wright Field, Dayton, Ohio, to check the strength and operating characteristics of airplane landing-wheel, brake, and tire assemblies. The machine was designed and built by the Adamson Machine Co., Akron, Ohio, in conjunction with the Aircraft Laboratory, Engineering Division, Army Air Forces, Air Technical Service Command. It is equipped with controls and motors built by the Westinghouse Electric Corporation.

The illustration shows a tire being examined immediately after a test. The test consisted of slamming the tire, which weighs three-fourths of a ton and measures 110 inches in diameter, against the 158-ton steel inertia wheel, which was rotating at a surface speed of approximately 2 miles per minute. The tire stopped the inertia wheel in twenty seconds. In this way, actual landing conditions are simulated without risking personnel or equipment.

Gas Turbines to Furnish Power for Airplanes

According to Westinghouse engineers, a new kind of aviation electric power plant is being developed. The prime mover is a small gas turbine. Connected to this turbine is a 24-K.W., 30-volt, direct-current generator, and a 2.5-K.V.A., 120-volt, 400-cycle generator. The equipment also includes a 5-H.P. motor for starting the turbine, batteries, a voltage regulator for each of the generators, and a 1000-ampere relay to prevent current from flowing from the battery to the direct-current generator.

Editorial Comment

Much is said about the need for engineering progress, additional research, and new opportunities for employment. All these are desirable, and nothing should be placed in the way of engineering progress and research. At the present moment, however, more important than any other phase in our national progress and well-being is the necessity for establishing such industrial relations as will permit us to take full advantage of the progress and research that has already been made and the knowledge that we already possess about industrial and agricultural production.

We have won the war abroad, but forces that care nothing for the well-being of the nation are now staging a war within our own borders, an industrial war that may well cripple the reconversion effort for a long period to come. Labor-

We Have Won a War Abroad; Let Us Not Stage One at Home

union leaders are bent upon industrial warfare at a time in our national history when what is needed more than anything else is industrial cooperation.

Management has indicated in a great many instances that it is willing to go half way—often more than half way; and there is ample evidence that large groups on the employe side would be willing to cooperate, but they are prevented from doing so by a leadership that has assumed the aspects of a dictatorship.

There are some unions that operate under a thoroughly democratic constitution, but unfortunately, the majority have not yet followed the example of these outstanding groups. Hence, reconversion is being sabotaged—the return to prosperous peacetime conditions is being retarded; and, if some of the union leaders could have their way, several of our great industrial enterprises would be wrecked.

This is a good time to begin to scan methods, processes, and systems to weed out all unnecessary work. When the pressure of business on manufacturing organizations was as great as it was during the war years, it was not possible to examine, in detail, into all the systems and procedures. The important thing was to get the work out; cost was of secondary importance. Under those circumstances, methods and systems were adopted that were not always the most economical for peacetime production; but if these methods are not

now scrutinized with care, they may continue to be applied long after they have outlived their usefulness.

This applies, perhaps, more specifically to office work and shop systems than to actual mechanical shop work. It is well to ask a few questions with

Systems and Records Sometimes Outlive Their Usefulness

regard to all systems and records kept: If this were not done, just what would happen? If these records were not kept, would it upset the

process of manufacture? If these reports were not made and filed, would they actually be missed? If these statistics were not kept or this commercial research work not done, would it affect sales? If this finish were not provided on equipment used in the shop, would it have any effect on manufacturing efficiency?

It is surprising how many systems and methods continue in use long after the purpose for which they were adopted no longer exists. The reconversion period is a good time to scrutinize all work of this character and to eliminate anything that does not directly relate to the ultimate purpose of an organization—the making and selling of a product that meets the requirements for which it is built, at the lowest possible price. We were not particularly cost-conscious during the wartime production period; but now when we are endeavoring to place industry again on a self-supporting peacetime basis, we cannot afford to spend time and money on unnecessary work.

The Office of Price Administration's policy of holding prices so low that they are either below the cost of production, or barely cover that cost, does not make for full employment. Individual

OPA Pricing Policy Does Not Encourage Full Employment

enterprise only can create employment, and to that end, management must be permitted to use its own judgment as to what prices it

must charge in order to maintain the business on a paying basis. No Dictatorship of Bureaucracy can promote prosperity by the methods now being used by the OPA, which hamper industrial enterprise and production. Now that the war is over, we could reconvert faster and reach a full employment level more quickly if there were less interference.

New Era Exposition to be Staged by Tool Engineers Society

CLEVELAND PUBLIC AUDITORIUM, APRIL 8-12

THE New Era Exposition sponsored by the American Society of Tool Engineers, which is scheduled to be held April 8 to 12 in the Public Auditorium, Cleveland, Ohio, has been planned with the express intention of demonstrating that the creation of more jobs is inseparably linked with better tool engineering. In announcing the exposition, C. V. Briner, president of the Society, emphasized that "a high level of production automatically brings about a high level of employment. This exposition, therefore, will feature industrial equipment capable of inaugurating and maintaining a period of great productivity.

"Effective tooling increases production and cuts manufacturing costs and prices of manufactured products. This means that a larger proportion of the population enters the market, sales volumes move upward, and the rise of gainful employment closely follows the sales trend."

The New Era Exposition will present a resumé of the most important technical advances of the war years, and will cover all fields related to production. Among the exhibits will be all types of tools; materials-handling equipment; control systems actuated by pneumatic, hydraulic, electrical, and electronic means; coolants and lubricants; and inspection instruments. A floor area of 250,000 square feet will be covered by the exhibits. This will be the largest exposition ever sponsored by the Society.

Efforts are being made to feature only tools and machines especially adapted for increasing the productive capacity of manufacturing plants; equipment for obtaining the greatest precision and close

tolerances obviously will be included. Many new tools and devices will be shown. The exhibits will feature equipment not only for the shop, but also for the designing and drafting-room, including adjustable drafting tables, drawing and tracing files, and improved drafting instruments and blueprint equipment. The object is to aid the tool engineer in handling his job most efficiently, that job being defined as follows: "To make it possible for industry to produce more goods and better goods at lower prices, while, at the same time, industry will be enabled to pay higher wages to the men who produce these goods."

It is expected that there will be a large attendance from all the chapters of the American Society of Tool Engineers throughout the country. In addition, the show is open to anyone engaged in industry who is interested in tooling equipment and production problems.

The program of the annual convention of the American Society of Tool Engineers, which will be held concurrently with the exposition, will include many important papers on subjects that are of the greatest interest in the present period of reconversion to peace production.

It is not necessary in this journal to stress the important part that the tool engineer plays in our production system, whether his work is done for peaceful purposes or for the successful conduct of war. The important position held by the tool engineer will be emphasized by the great exposition of machine shop tools and equipment to be sponsored by the American Society of Tool Engineers in Cleveland within a few weeks.

Industrial Cleveland at Night



The "Lathe Converter" Changes a Lathe into an All-Around Machine Shop

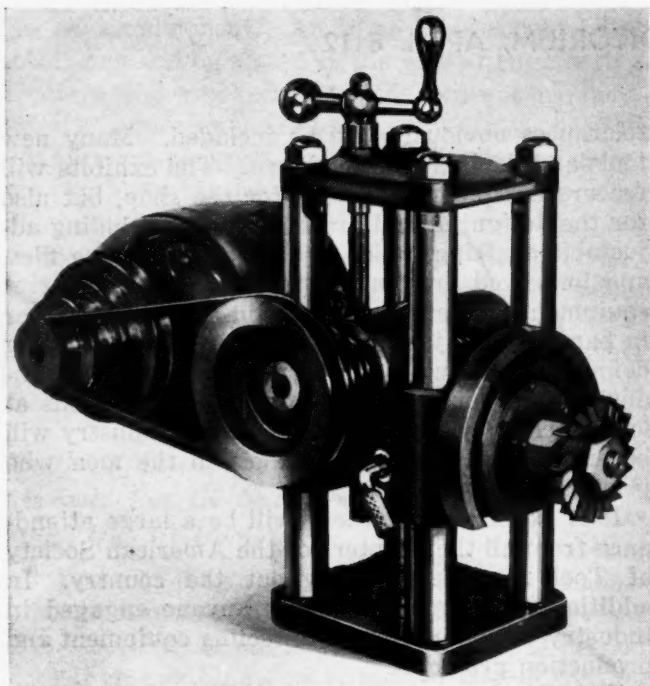


Fig. 1. Self-contained Master "Lathe Converter" Ready to be Mounted on the Cross-slide of a Lathe Carriage

An unusual type of equipment known as the Master "lathe converter" was developed during the war by the Master Mfg. Co., Hutchinson, Kan., for use by the Army on mobile repair units. These repair shops on wheels were capable of doing practically any type of field, maintenance, or repair work with the equipment that they carried. They were able to turn shafts; cut keyways, both external and internal; and cut gears, threads, worms, and screws. They could cut internal and external splines, and machine squares and hexagonal shapes on shafts; and they could perform internal, external, and surface grinding, as well as a wide range of required boring and drilling operations.

Yet they were not loaded down with a variety of machine tools. An engine lathe provided with the lathe converter, in addition to a small drilling machine, constituted the entire machine tool equipment. This equipment was also used at Army aircraft maintenance bases, where the combination of lathe and converter made possible the performance of a complete range of machine tool operations within the capacity of the equipment.

The lathe converter, shown in Fig. 1, is now available for commercial use. It consists of a basic unit by means of which milling, boring, facing, keyway cutting, and drilling operations can be per-

formed. It is also supplied with interchangeable heads for external and internal grinding, for angular milling, and for cutting threads, worms, and screws. A broaching attachment is available for cutting internal keyways and splines, and a dividing head, mounted on the open end of the lathe spindle, makes it possible to index work, when this is necessary. The lathe converter is equipped with its own power, but can make use of the lathe spindle for rotating the work to be operated upon when operations of that character are to be handled.

This equipment should be particularly useful for a machine shop that is limited in space or that is not able to invest in a large variety of machine tools, and is exceptionally well suited to repair shops on board ships. It is expected that it will provide a most satisfactory means for experimental work, tool- and die-making on a small scale, or maintenance work that ordinarily would require several relatively high-priced machine tools, some of which would have only occasional use.

The small maintenance shop now usually equipped with only a lathe or drilling machine can, with the addition of the lathe converter, handle practically any type of machining within its capacity. Even operations normally requiring a jig borer or other machine provided with a rotating table can be handled by turning the lathe spindle with the dividing head, thereby placing the work in position for such operations as spacing drilled holes around a center.

While the lathe converter's greatest use will probably be in connection with lathes, it is obvious that it can also be mounted on a milling machine, thereby providing vertical milling capacity for a horizontal machine. In some instances, it has been used for rounding out the production facilities of small shops by converting standard machines into special-purpose machines, thereby avoiding large investments in specially built machines. It is pointed out that this equipment can also be used for precision work. During the war, it was employed for making aircraft and propeller parts, and for making "Go" and "No Go" gages for inspection.

The equipment is made in three sizes adapted for lathes ranging all the way from the bench type to those of 36-inch swing; the three sizes are provided with motors of 1/4, 1/3, and 3/4 H.P. capacity. It can be applied to any make of lathe, since it is mounted in the toolpost position on either the compound rest or on the cross-slide of the carriage, with the compound rest removed. The accompanying illustrations and their captions indicate clearly the range of application of this versatile machine shop auxiliary.

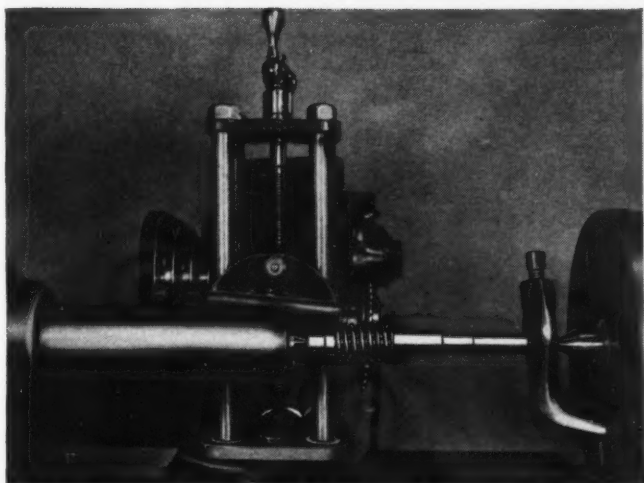


Fig. 2. Milling 4-pitch Worm Thread with Formed Cutter



Fig. 3. The Lathe Converter Used as a Tool Grinder



Fig. 4. Cutting an Internal Keyway in a Gear

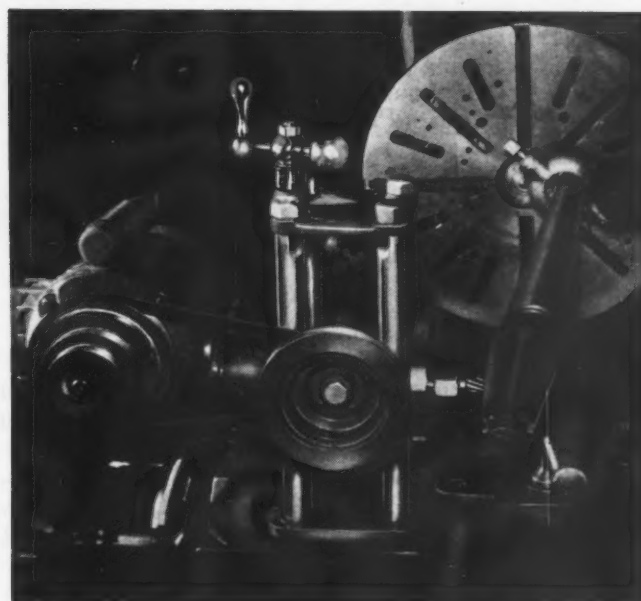


Fig. 5. Milling a Keyway in a Tapered Shaft



Fig. 6. Milling a Woodruff Keyway in a Shaft

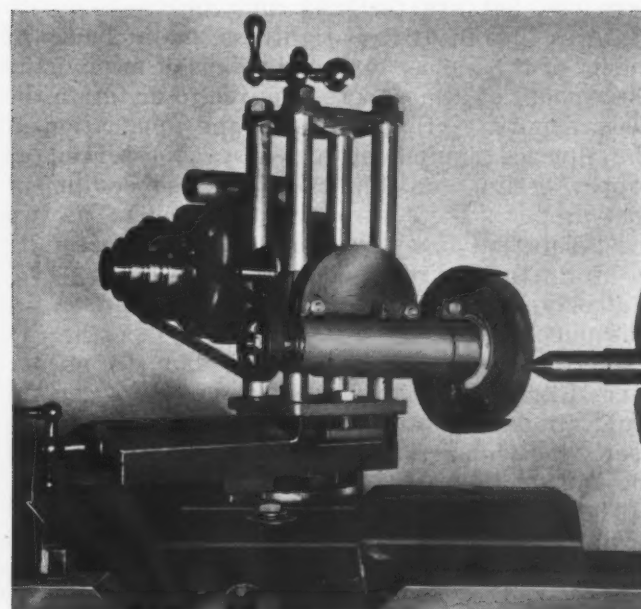


Fig. 7. Grinding Worn Lathe Centers

Furnace Equipment for Bright-Hardening

Principal Types of Industrial Furnaces Used in Connection with Bright-Hardening Atmospheres – Second of Two Articles, the First of which Dealt with Furnace Atmospheres

By C. E. PECK, Manager
Industrial Heating Engineering
Section, Westinghouse Electric
Corporation, East Pittsburgh

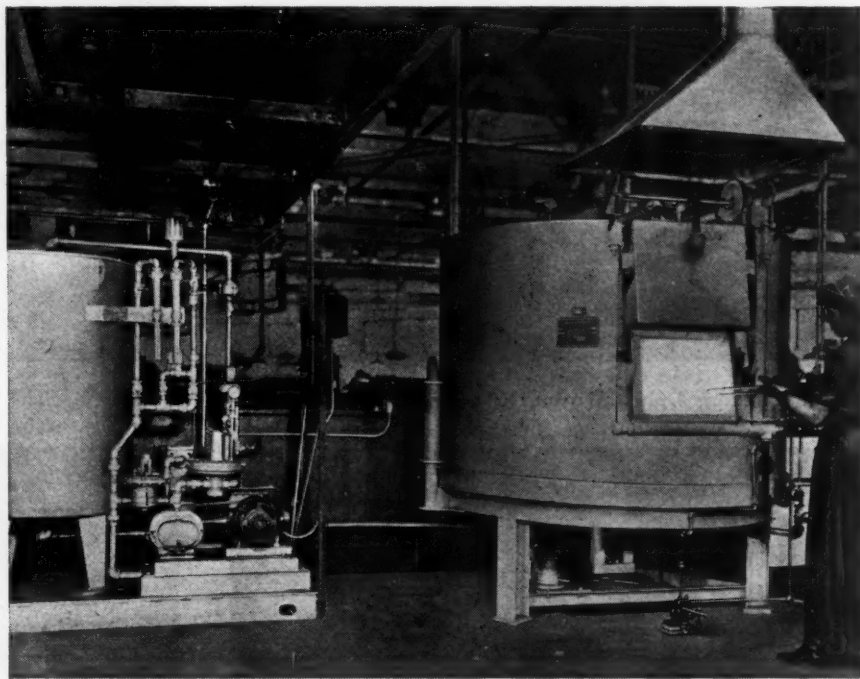


Fig. 1. Rotary-hearth Furnace Employed for Bright-hardening

AN article in February *MACHINERY* on "Bright-Hardening of Tools and Machine Parts in Controlled Atmospheres" dealt with the atmospheres and generating units used in connection with bright-hardening, and evaluated the metallurgical effects on various types of steels. The present article describes furnace equipment used for bright-hardening.

The principal types of furnace equipment used with controlled atmospheres for bright-hardening are similar to many of the conventional hardening furnaces, but are designed and constructed with features that insure gas-tightness, maintenance of purity of the atmosphere, and means of minimizing the amount of atmosphere required to maintain the desired purity. Proper design and application of the furnace equipment are just as essential as proper design and application of the equipment that produces the controlled atmosphere. The two must function together and perform successfully to attain the desired metallurgical results.

Briefly, the principal types of furnaces used for this purpose are (1) box, (2) rotary-hearth, (3) shaker-hearth, (4) belt-conveyor, and (5) pusher type. Each of these furnaces is suitable for certain applications. The choice of type depends on the user's individual problem, the type of work, and the amount of production.

The box type is a general-purpose furnace particularly useful where the production requirements do not involve too large a number of the same part. It is a good "job lot" furnace. This furnace can be operated over a wide range of temperatures. For hardening, the pieces must generally be handled

individually, but small pieces can be heated in pans and quenched together, with the work in the pan. Box type furnaces designed for high temperature are especially useful for tool hardening.

The rotary-hearth furnace, shown in Fig. 1, is a production furnace which allows continuous loading and unloading of machined parts which require individual handling. It is particularly useful for parts that require fixture quenching in presses to prevent distortion. Typical applications include heating of machined parts, such as gears and shafts, or small parts loaded in trays. The intermittent hearth movement is automatically controlled and timed. As the furnace door is opened, a blast type flame-curtain is automatically turned on; this is quite effective in preventing air from contaminating the protective, non-decarburizing atmosphere within the furnace.

Fig. 2 shows samples of a wide variety of machined parts which can be bright-hardened without decarburization in the various types of furnaces described. There is, however, one type of furnace that is best for each particular part, depending on material-handling needs and production.

One production furnace that is very convenient from a material-handling standpoint is the continuous cast link-belt conveyor type. These furnaces can be equipped with either manual or automatic charging devices. After being conveyed through the furnace on the belt, the work drops into a quenching tank, where another conveyor continuously moves the work from the tank into the open. Typical applications are the hardening of bolts, screws, bearing races, wrist-pins, wrenches, small

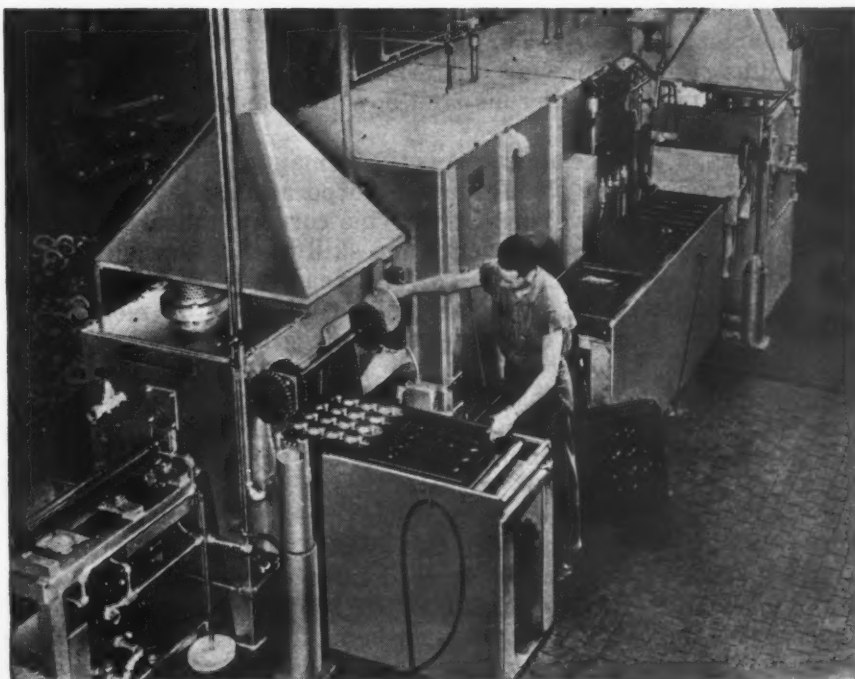
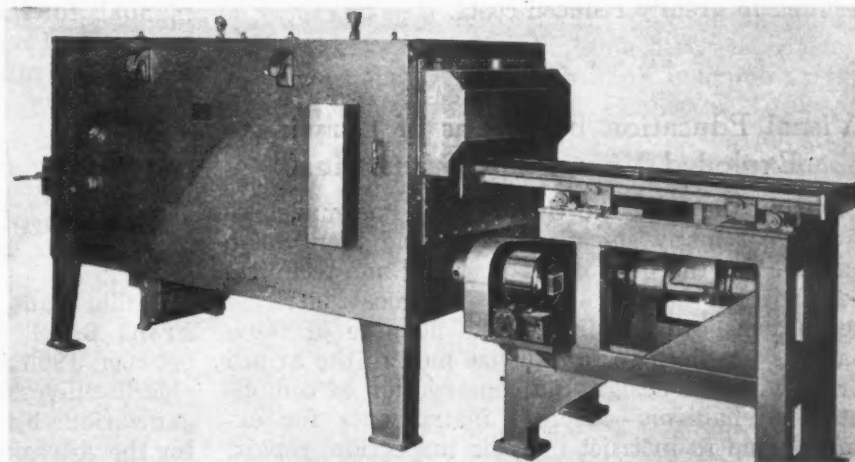
Fig. 2. (Top) Variety of Machined Parts that are Bright-hardened in Furnaces with Controlled Atmospheres
Fig. 3. (Center) Shaker-hearth Furnace.
Fig. 4. (Bottom) Pusher Hardening Furnace

gears, etc. Heavier or large-diameter parts, or any part that has sharp edges that are likely to "nick" as the parts drop into the quenching tank, are not suitable for hardening in this type of furnace.

For very small parts or for very thin parts that have sharp edges, a solid hearth instead of a link belt is desirable. A solid-hearth type which can convey work through the furnace in a continuous manner is the shaker-hearth type shown in Fig. 3. The work drops from the hearth into the quench, as in the case of the cast link-belt conveyor type, and may be conveyed from the quench automatically. Typical applications of this type of equipment include the hardening of knife blades, small flat springs, screws, small bolts, miscellaneous hardware, and similar parts. Parts that are round, or roll easily, are not suitable to be handled by the shaker-hearth type; also, heavier and larger-sized machine parts should not be heated in this type of equipment because of the danger of "nicking."

Production heating for hardening of both large and small parts, in cases where "nicking" must be eliminated entirely, is successfully done in the pusher type furnace, shown in Fig. 4. The work is placed on trays, which are intermittently pushed through the furnace on a timed cycle. The quenching is automatic. The type of quenching equipment used minimizes or eliminates distortion. Quenching may be done in a fixed position or the tray holding the work may be agitated mechanically to insure uniform hardness. This method is well adapted for hardening steels of low hardenability.

All operations in the pusher type furnace—from the instant the tray load of work enters the



furnace—are automatic on a timed basis. This, together with uniform distribution of temperature and accurate control of atmosphere, gives very uniform and consistent results. The human element is practically eliminated, making this equipment a truly automatic heat-treating machine. Typical parts that are hardened in this type of furnace are large and small gears, crank-arms, valves, splined shafts, counterweights, long slender shafts (which are handled vertically), bearing races, connecting-rods, and similar work.

Bright-hardening equipment that permits heating without loss or gain of carbon on the surface of alloy and carbon steels, tool steels, etc., is now available to industry for problems involving accurate, uniform heat-treatment of machine parts on a job or production basis. Non-decarburizing atmospheres produced directly from fuel gases, and furnace equipment specifically designed for the successful commercial use of these controlled atmospheres, have been completely developed and are finding wide industrial use. The new methods are economical in operation, and have, in many cases, resulted in greatly reduced costs.

* * *

Visual Education by Means of Drawings, Exploded Views, and Transvision

During the war, the Government has made use of a great many so-called visual and transvision manuals for the purpose of teaching non-technical men how to handle some of the most intricate mechanisms ever devised. The purpose of these manuals has been to familiarize men in the armed forces with the design and construction of complicated mechanisms—aircraft instruments for example—and to instruct in their inspection, repair, maintenance, and operation. These manuals are the products of true engineering skill—a skill that translates technical language into basic terms understandable by the average man, and that can create illustrations showing pictorially how the equipment is built, how it runs, and how it is kept running.

Some of the most elaborate of these manuals have been produced by the Jordanoff Corporation, 595 Madison Ave., New York City. This corporation is now applying its experience and skill to the production of similar manuals for the peacetime industries—for example, to showing pictorially the construction of machine tools, automobile engines, Diesel engines, and electric and hydraulic equipment. Through these manuals and the illustrations provided, the teaching of the repair, maintenance, and operation of such equipment becomes comparatively easy.

It has been said by officers in charge of technical staffs in the Air Corps that with this type of manual, inexperienced men can be trained in approximately one-third the normal time. It has been found that technical information can be explained better and more quickly by using carefully pre-

pared pictures and a brief statement, instead of the usual lengthy written descriptions.

One of the most interesting of the developments along this line of training literature is the transvision manual which, as the name implies, is a "seeing through" process, a method of printing illustrations of a machine or mechanism, layer by layer, on transparent acetate. The transvision picture takes the eye through the outer surfaces, showing the inner structure in minute detail in colors, and demonstrating the relationship not only between the parts but between each part and the whole. Actually, with transvision, it is possible to show more of an intricate mechanism than could be seen if the mechanism itself were taken apart.

It is believed that this method of visual training will prove of great value in many post-war fields, since it is applicable to almost any type of machine or mechanism that is built in sufficient quantities to require a fairly large number of training manuals. The automotive, the machine tool, and many of the household equipment industries are likely to become interested in this method of preparing manuals for those who have to look after the maintenance and repair of such equipment. This visual method of training is simply a new tool introduced into industry.

* * *

Digest of Frank B. Gilbreth's Films Now Available

A film made from the original films produced by Frank B. Gilbreth—the father of motion study—between 1905 and 1924 has now been made available to universities and business and industrial organizations by the Chicago Chapter of the Society for the Advancement of Management, in collaboration with Dr. Ralph M. Barnes, professor of industrial engineering and director of personnel, State University of Iowa, Iowa City, Iowa; Dr. Lillian M. Gilbreth, management consultant of Montclair, N. J.; and James S. Perkins, chief of personnel developments section, Hawthorne Works, Western Electric Co., Chicago, Ill.

This film, entitled "The Original Films of Frank B. Gilbreth," is a digest presenting the historic background of motion study and the principles of motion study which Mr. Gilbreth promulgated, many of which are recognized as the cornerstone of modern industrial engineering. Some of the more significant studies included in this film are: The Brick Laying Project which Led to Motion Study; Factory Operations which Led to the Development of Motion Study Principles; the First Methods Studies of Surgical Operations; Frederick Taylor's Pig Iron Carrying Experiment; and a Study of Skill by the Cyclegraph Technique. A charge of \$75 is made for the use of the film to cover the cost of producing it. Further information can be obtained from the Chicago Chapter of the Society for the Advancement of Management, 426 S. Maple Ave., Oak Park, Ill.

Tool Engineering IDEAS

Fixture for Milling Tool Shanks

The high-carbon steel tool shank shown in Fig. 1 has the tip seat *G* milled to take a carbide tip for heavy-duty roughing. The fixtures illustrated in Figs. 2 and 3 were designed for machining the angular surfaces and the carbide tip seat on these shanks.

The fixture shown in Fig. 2 holds two rows of shanks, one above the other, for milling the 45-degree face with a 10-degree rake. The lateral inclination of 100 degrees, shown in the front elevation, is used to obtain the 10-degree front rake. Longitudinal binding screws are used in the holes *A* and set-screws *D* are employed in the forged steel plates *E* to bind the shanks to the face *C*. The binding plates are attached to the walls *F* of the fixture.

The ends of the shanks that are not to be machined rest on the machine table, and the opposite ends project above the top face of the fixture to permit the necessary amount of stock to be removed. Section *X-X* shows the shanks in position after the 45- and 10-degree angles have been machined. The 60- and 10-degree angles were milled in a previous operation, using a similar fixture. When retipping becomes necessary, involving short-

ening of the shank, compensating blocks are inserted between the bottom ends of the shanks and the machine table.

Two identical fixtures are used in machining these shanks, spaced a suitable distance apart on the horizontal table of a milling machine so that one fixture can be unloaded, cleaned, and reloaded while the shanks in the other are being milled.

The fixture shown in Fig. 3 is used for milling the tip seat *G*, Fig. 1. This fixture is built in two parts, the upper part being rotatable to reduce idle machine time. The upper part is divided into two compartments, each accommodating six tool shanks. The rear compartment is shown empty in Fig. 3. The two end walls *H* and *H*₁ carry the diagonal binding screws *I* and *J*, and the integral center wall *K* takes the thrust of these screws.

The base *N* is bolted to the machine table and the top casting *M* indexes about the central pin *O*. This pin is hardened, ground, and a drive fit in the base. The top tapered portion of the pin engages a hardened and ground steel bushing which is a drive fit in casting *M*. Both of the holes *P* have separate bushings in members *M* and *N*. As the top of the fixture is indexed for each reloading, the pin *Q* enters one of the holes *P*. The top casting of this fixture is clamped to the base by the swing-

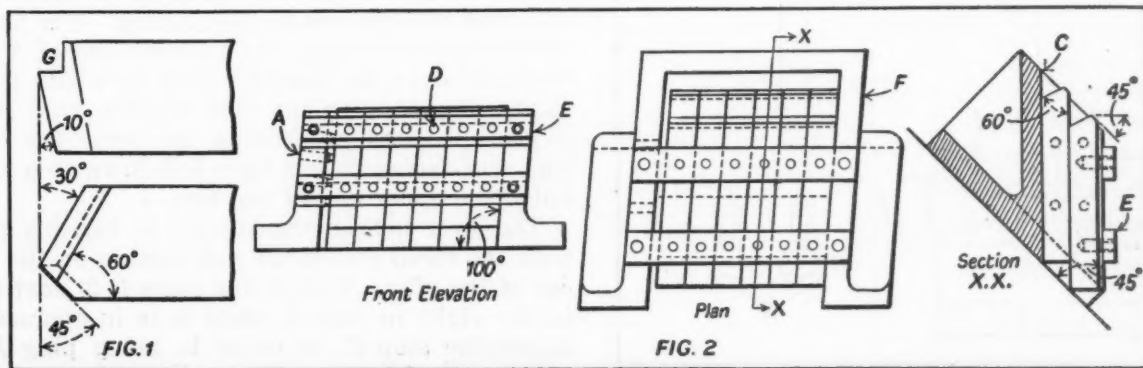


Fig. 1. High-carbon Steel Tool Shank with the End Machined to Take a Carbide Tip

Fig. 2. Fixture for Milling the 45-degree Angle with 10-degree Rake on Tool Shank

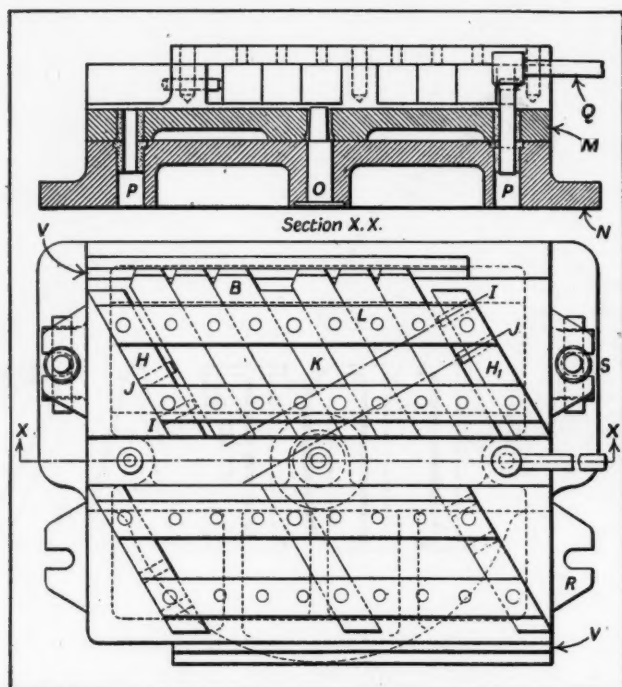
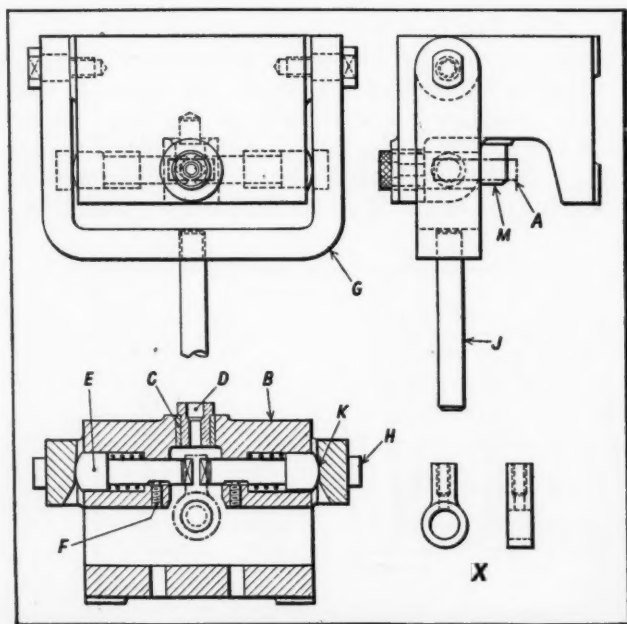


Fig. 3. Fixture for Milling Carbide Tip Seat on Tool Shank

bolts *S* which engage slotted lugs in the casting. When being loaded into the fixture, the tool shanks are positioned against register strips *V*, which fit into slots at both back and front of the fixture.

Jig for Drilling, Tapping, and Spot-Facing the Shank End of a Small Forging

The jig here illustrated and described was constructed for drilling, tapping, and spot-facing the end of the steel forging shown at *X*. The forging

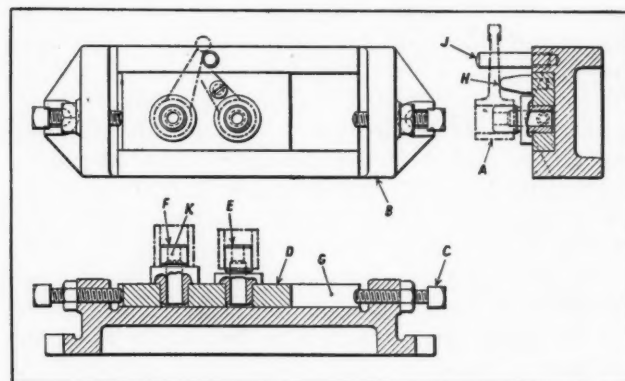


Jig Equipped with Equalizing Clamp and Slip Bushings for Drilling, Tapping, and Spot-facing Forging *X*

is clamped in the fixture by a single movement of the swinging strap *G* which applies an equalizing clamping pressure. The cast-iron body *B* of the fixture is fitted with a liner bushing *C*. Two slip bushings *D* made to fit the liner provide for the drilling and tapping operations. The liner bushing itself serves as a guide for the spot-facing tool.

The work-holding plungers *E* are fitted in counterbored holes in the body *B*. A V-slot cut in the inner end of each plunger serves to centralize the end of the piece to be machined in line with the slip bushings. The previously reamed hole in the forging is a slip fit over the locating plug *M* which positions the work, as indicated at *A* in the upper view to the right. Set-screws *F* which enter grooves milled in the plungers *E* serve as guides and retainers for the latter members.

When the U-shaped clamp *G* is swung downward by means of lever *J*, pivoting about studs *H*, it forces the plungers *E* inward until the wedge surfaces at *K* exert the required clamping pressure. When strap *G* is swung upward to release the work, helical springs between the shoulders of the plungers and the bottom of the counterbores force the plungers outward to their open positions.



Spot-facing Fixture Used in Drill Press for Finishing Ends of Lever Hub

Fixture for Spot-Facing Ends of Lever Hubs

The fixture shown in the accompanying illustration is used on a drill press for spot-facing both ends of the hub at the large end of forged lever *A*, indicated by dot-and-dash lines. The hub is drilled and reamed previous to spot-facing. For the first spot-facing operation, the reamed end of the hub is placed over the locating plug *E*, which is accurately aligned with the drill spindle, stud *H* with a V-shaped end positioning the lever for height. The spot-facing tool is then fed down to a stop to finish the upper end of the hub.

The lever is then transferred to locating plug *F* with the faced end of the hub resting on the shoulder of the plug. The sliding plate *D* is next moved to the right in base *G* until it is in contact with adjustable stop *C*, in order to bring plug *F* into alignment with the drill spindle. The spot-facing tool is again fed down to the stop, thus completing the facing operations. The finished lever is removed

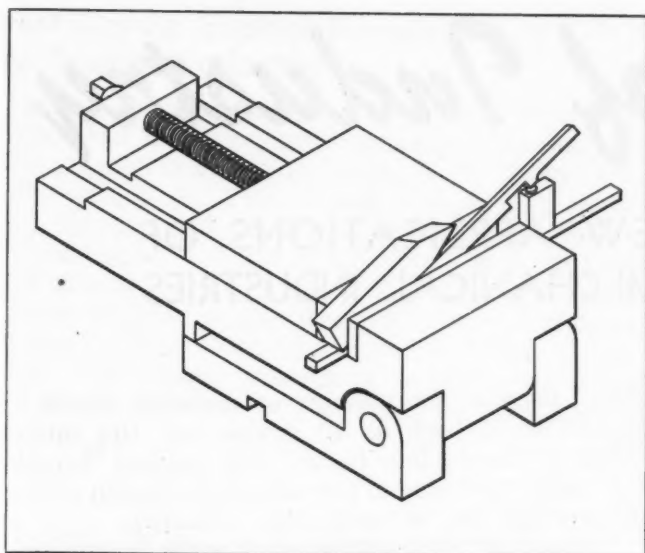


Fig. 1. Isometric View of Set-up for Grinding Angles of Threading Tool by Using Angle Vise, Sine Bar, and Block

and the same procedure followed in facing the hub of the next lever, the slide *D* first being moved to the left into its original position. A hole *K* in each of the locating plugs serves as a guide for the pilot at the end of the spot-facing tool. S. S.

Sine Bar with Adjustable Blocks

By WILLIAM H. MANTON, Philadelphia, Pa.

A one-piece sine bar, a few adjustable sine blocks, and a small parallel have proved convenient in the toolmaking department of Proctor & Schwartz, Inc., of Philadelphia, for setting up small work to be machined or ground to angles that must be held to an accuracy of minutes. When used

in conjunction with an angle vise, it is possible to grind compound angles on thread-cutting and other tools at the same set-up, as shown in Fig. 1. The sine bar tool is removed from the vise before the grinding operation.

The sine bar and blocks were constructed from hardened and ground tool steel. The blocks were provided with fillister-head set-screws and Allen screws, as shown in Fig. 2. A few sizes of adjustable blocks, only one of which is illustrated, permit the toolmaker to make a wide range of settings. The setting is made by adjusting the Allen screw to provide an over-all height, measured by a micrometer, that corresponds with the natural trigonometric sine value for the angle required. The Allen screw is locked in position by means of the fillister-head set-screw. The sine bar, block, and parallel are placed in position to measure the desired angle in the manner shown by the example in Fig. 3.

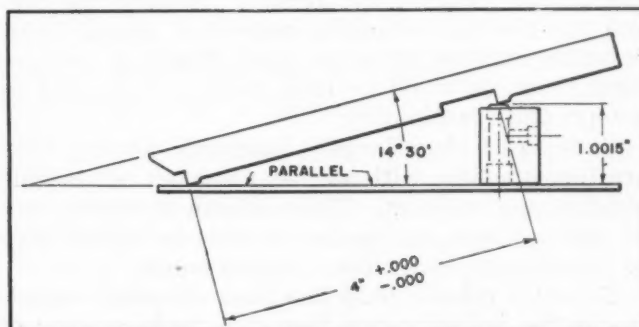


Fig. 3. Typical Set-up of Sine Bar, Adjustable Block, and Parallel

* * *

In the field of government, we can do nothing better or more effective than to restore and maintain our form of government under the Constitution which has served us so well for so long, and under which we built the strongest nation and enjoyed the greatest personal liberty and the highest standard of living in the world. The full and unfettered functions of the independent Executive, Congressional, and Judicial branches of our Government should be restored, and maintained as far as possible to the original intent of the framers of our Constitution. We should insist upon the restoration of the principle of government by laws and not by men.—*Lawrence B. Morris before the Pressed Metal Institute*

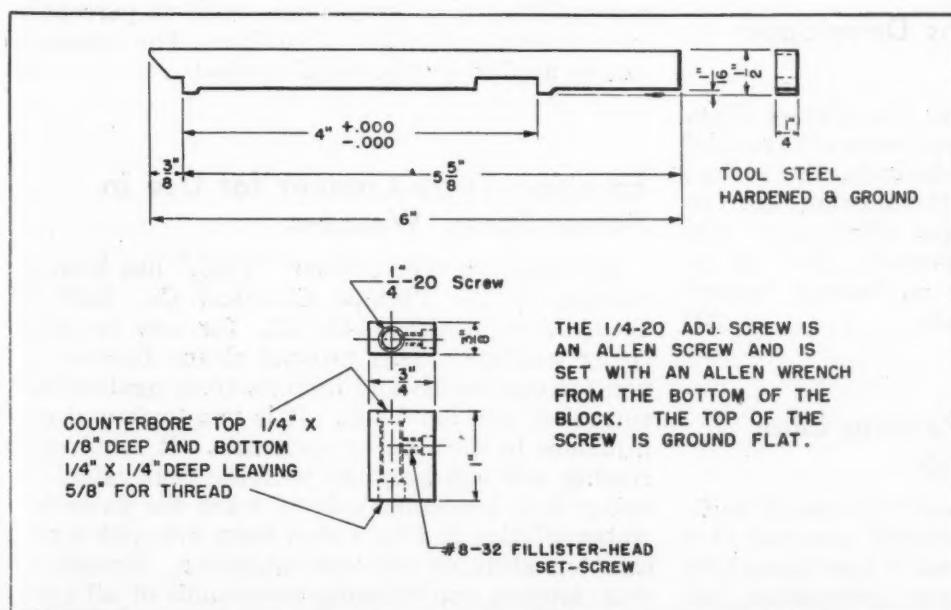


Fig. 2. Sine Bar and One of the Adjustable Blocks

Materials of Industry

THE PROPERTIES AND NEW APPLICATIONS OF MATERIALS USED IN THE MECHANICAL INDUSTRIES

Silicone Mold Release Fluid and Compound Aid Rubber and Plastic Molding

Two Silicone products, known as "DC mold release fluid" and "DC 7 compound," have been brought out by the Dow Corning Corporation, Midland, Mich., for use in molding rubber and plastic materials. These mold release agents serve as lubricants, reducing the friction between the dies and the plastic materials, improving plastic flow, reducing surface striation, and affording easy release from the mold or from rubber bags used in low-pressure laminating.

Because of their largely inorganic nature, they are incompatible with almost all types of organic plastics and rubbers. They adhere to metal, and do not vaporize, carbonize, or change appreciably in consistency at molding temperatures.

DC mold release fluid has been especially effective in the injection molding of a wide variety of plastic materials, including ethyl-cellulose, polystyrene, cellulose acetate, cellulose aceto-butyrate, and synthetic rubbers. It is equally effective in securing the release of large sheets in press polishing operations, and in preventing the warping, on removal from the die, of large compression-molded thermoplastics. 201

Non-Hazardous Solutions Developed for Bright Dipping

Waverly Petroleum Products Co., Drexel Bldg., Philadelphia 6, Pa., has developed several "Troxide" bright dip formulas which eliminate the serious hazards present in the conventional bright dip formula consisting of sulphuric and nitric acids. The new solutions are easy to prepare, give off no offensive fumes, and provide no hazard through accidental splashing on the skin.202

Synthetic Waterproof Packing Liner Fabric Permits "Breathing"

A tough, flexible, and resilient waterproof packing liner fabric made of synthetic material that has been impregnated and coated is now being produced by the Protective Coatings Corporation, 689 Main St., Belleville 9, N. J. Although fully waterproof, this new packing liner fabric, called "Aqua-

stop," permits the passage of moisture vapor in quantities as high as 10 grams per 100 square inches in twenty-four hours. This unusual "breathing" property tends to prevent condensation within the package due to temperature changes.

"Aquastop" will withstand changes in temperature ranging from minus 20 to plus 175 degrees F. at maximum relative humidity without cracking, tackiness, flow, or loss of flexibility or waterproofness. In making up a package with this material, all seams are sealed with "Aquastop" cement, which produces a completely waterproof barrier between the contents and the exterior wooden shipping box.203

Non-Corrosive Rust Remover for Precision Bearings and Machined Surfaces

A new rust remover produced by the Nox-Rust Chemical Corporation, Chicago 8, Ill., is particularly suitable for removing rust from precision bearings and machined surfaces without affecting critical dimensions. Laboratory tests on highly polished roller bearings weighed to one ten-thousandth of a gram accuracy have shown weight losses of less than 1/20 of 1 per cent, even after eight hours' immersion. Ordinary rust removal is accomplished in a few seconds, with no perceptible etching or discoloration of surfaces. The compound can be applied by the usual methods.....204

Emulsion Type Cleaner for Use in Power Spray Washers

An emulsion type cleaner, "PSC," has been developed by the Phillips Chemical Co., 3420 W. Touhy Ave., Chicago 45, Ill., for use in power spray washers. This product cleans ferrous and non-ferrous metals and inhibits them against rust, corrosion, and hand soil. It is non-toxic and non-injurious to the skin or open cuts. It requires no rinsing and will keep the washing tank clean. In using, it is necessary only to wash the parts in a water solution and then blow them dry with air for complete cleaning and rust inhibition. Grease, oil, wax, lapping and drawing compounds of all kinds, red lead and other markings, abrasive dust, chips, etc., are removed from all exposed surfaces....205

Fast Drying Enamel Developed to Speed Production

A fast drying baking enamel called "Porciflex," which has high resistance to acids, alkalis, oils, and greases, is a product of the H. V. Walker Co., Elizabeth, N. J. This enamel is applied by spraying, dipping, or by roller coating machine, and requires baking only for short periods varying from one minute at 450 degrees F. for sheet steel to fifteen minutes at 275 degrees F. for other types of work. It is also well adapted to infra-red baking. This enamel is available in black, white, and a wide variety of colors, as well as in a transparent finish. 206

Nylon Valve Seats Substituted for Those of Metal

The metal valve seats formerly used for U. S. Navy torpedo stop valves had to be hand-lapped to fit tightly against an air pressure of 2800 pounds per square inch. Even after lapping, dirt particles frequently entered the metal valves and prevented them from closing tightly.

When Nylon valve seats were substituted, the hand-lapping operation was eliminated. Since the plastic material is deformable, a close, tight fit was obtained without expensive hand work. Minor surface irregularities did not cause leakage, and a 20 per cent reduction in the weight of the valve resulted. Preliminary tests have indicated that Nylon is suitable for valve seats for faucets, gasoline pumps, air hose, and gas cylinders.....207

Safety Solvents for Cleaning Precision Bearings and Instrument Parts

The first of a series of safety solvents to be called "G-Sol" has been announced by Gaybex Corporation, Nutley, N. J. The various grades will be identified by numbers indicating their respective flash points. The solvents are water white, and are characterized by high flash points and freedom from elements of toxicity and corrosion. G-Sol 195—the first of the series—has been found useful for cleaning precision bearings, instrument parts, and similar mechanisms where both grease and oil gums are troublesome.208

Black Plastic Dye Sets to Permanent Ebony Shade

A black plastic dye that can be applied in fifteen minutes, producing a permanent ebony shade, has been placed on the market by the Krieger Color & Chemical Co., 6531 Santa Monica Blvd., Hollywood 38, Calif. The new product is now available in all of the four major types of plastic dyes produced by this firm. These four types of plastic

dyes, known as "Krieger-O-Dip," are "S" chemical dyes used on Lucite and Plexiglas; "A" for dyeing cellulose acetate, Tenite, and Vinylite; "P" used on polystyrene; and special "W" hot water dye used on almost any form of plastic.....209

Chlorinated Rubber Base Paint is Again Available

With the increased availability of rubber, "Paratex," a paint that was used as a covering for concrete floors prior to the war, is again being produced by Truscon Laboratories, Inc., Detroit 11, Mich. This paint withstands the action of lime and moisture in concrete, and is also useful for protecting iron and steel surfaces, due to its waterproof qualities and high resistance to chemical change. 210

Heat-Resisting Plastic Tubing Has Improved Flexibility

A flexible plastic tubing with unusual heat-resisting qualities has been brought out by the Irvington Varnish & Insulator Co., Irvington, N. J. This product, called "Fibron," has the ability to withstand varnish treatment and baking operations without stiffening, even in applications where extreme operating temperatures are encountered. It is also resistant to strong acids and alkalis, denatured alcohol, petroleum and its products, and coal tar solvents. Tests by initial users have shown that the tubing performs satisfactorily in instances where high dielectric and tensile strengths are important. 211

Thread and Gasket Sealing Compound for General-Purpose Use

A general-purpose thread and gasket sealing compound which is proof against air, water, steam, gas, gasoline, oil, hydraulic fluids, and aromatics has been announced by the Parker Appliance Co., Cleveland, Ohio. This compound, known as "Uni-seal," has been found to be virtually insoluble in gasoline, kerosene, Stoddard solvent, benzene, xylene, carbon disulphide, the ketones, acetones, and the various aromatic aviation fuels. It is furnished in the form of a paste of uniform consistency, and contains no free metallic particles that might set up corrosion due to galvanic action and no additives subject to washing out. It flows smoothly to form ribbon gaskets, and blends readily with cut gasket material. Its solubility in alcohol and carbon tetrachloride permits easy removal where required. Disassembly and rearrangement of work on which the new compound has been used are facilitated, as the seal breaks cleanly with the application of minimum force.212

Performance of Milling Cutters with Cushioned Blades

IN February MACHINERY, page 213, a type of milling cutter with cushioned blades, made by the General Tool & Die Co., Inc., East Orange, N. J., was illustrated and described. In some milling tests carried out with cutters of this design, unusual results have been obtained. In examining the figures quoted in the following, it should be understood that the speeds and feeds referred to are not recommended for everyday production milling, but were used merely to demonstrate the shock-resisting qualities and the capacity for carrying a heavy load per tooth that cutters designed with cushioned blades possess.

The tests were conducted on a milling machine by no means new, powered by a 10-H.P. motor. This does not mean, of course, that in taking the maximum cuts only 10 horsepower was expended, as obviously, an electric motor is capable of considerable overload for brief periods. A watt-meter was not used in this case to determine exactly what the power output was when the maximum cuts were taken.

The tests were made with a 6-inch diameter end-mill having twenty teeth. These teeth were made from 12 per cent cobalt high-speed steel, cushioned as described in the article in February MACHINERY, and copper-plated. The purpose of the copper plating is to increase the friction between the cutter body and the blades. The cutter teeth had a 5-degree positive rake and were set at a 5-degree

positive helix angle. They were ground in position on the milling machine. Roughing and finishing cuts were taken with the same cutter.

The tests were run on "Max-El" shank steel, a chromium molybdenum steel containing approximately 0.5 to 1.0 per cent manganese, 1 per cent chromium, and 0.20 per cent molybdenum. This steel is similar to SAE 4150, and has a Brinell hardness of about 250. A soluble oil of the type regularly supplied by the oil companies was used as a coolant. With a cutter speed of 245 R.P.M., equivalent to 385 surface feet per minute, depth of cut of 1/16 inch, table feed of 25 inches per minute, and feed per tooth of 0.005 inch, 9.4 cubic inches of metal were removed per minute. Retaining the same cutter speed, but with a depth of cut of 0.040 inch, a table feed of 150 inches per minute, and a feed per tooth of 0.036 inch, it was found possible to remove 36 cubic inches of metal per minute.

When the cutter was used for milling Meehanite with a cutter speed of 224 surface feet per minute, depth of cut, 1/8 inch, table feed, 100 inches per minute, and feed per tooth, 0.035 inch, 50 cubic inches of metal were removed per minute.

As mentioned, these speeds and feeds are not recommended for regular production work, but were used to demonstrate the capacity of the cushioned-tooth cutter as regards shock resistance and load resistance per tooth.

Practical Pointers on the Establishment of Incentive Payment Plans

HOW a sound wage incentive plan can be installed, so as to increase the earnings of labor, improve plant efficiency, and at the same time, reduce the cost of the products being made, thus providing "more goods at less cost for more people," is outlined in a publication entitled "Practical Pointers on Incentive Plans," published by the Labor Relations Institute, 1776 Broadway, New York 19, N. Y. This report presents a complete guide to the advantages of the best known types of incentive plans.

The most important factors in establishing a wage incentive plan, according to this report, are as follows: The plan must be made to fit the individual conditions and policies of the plant in which it is to be installed; it must be so simple that every worker can calculate his own earnings; provision must be made for adjusting grievances; it should be formulated and installed by people experienced in doing this kind of work; if there is a labor union in the plant, the union should be consulted on the plan; provision should be made for a

revision of the plan when methods, tools, or products are changed; after installation, the management must continue to pay close attention to the plan so as to observe how it works; job evaluation to eliminate rate inequities should precede the installation of the incentive plan; there should be provision for compensation to the workers if they have to wait for materials or machinery repairs or are hampered by other unusual interruptions; an immediate increase in production should not be expected; runaway plans, where the earnings of the workers may rise above those of the foremen, should be guarded against; special foremen incentive plans or bonuses should be given consideration to maintain normal pay differentials.

According to the publication referred to, well balanced incentive programs should increase the take-home pay of the worker from 15 to 20 per cent. On the basis of a study of over 400 incentive installations, labor costs will be reduced, on an average, 11 per cent, while production may increase anywhere from 20 to 35 per cent.

Shop Equipment News

*Machine Tools, Unit Mechanisms,
Machine Parts, and Material-
Handling Appliances Recently
Placed on the Market*



New and Improved Monarch Machines

Three new and two improved machines have recently been placed on the market by the Monarch Machine Tool Co., Sidney, Ohio. One of these machines is the "Mona-Matic," shown in Fig. 1, a lathe designed as a manually operated or semi-automatic machine for first- and second-operation work on gear blanks, straight and flanged bushings, and various types of shafts

with one or more steps. This machine has an unusually wide range of spindle speeds—from 75 to 3000 R.P.M.—and is provided with front and rear carriages incorporating several automatic features.

The front carriage, having power-driven longitudinal and transverse feed movements, can be equipped either for manually operated return, or with a semi-automatic cycle and

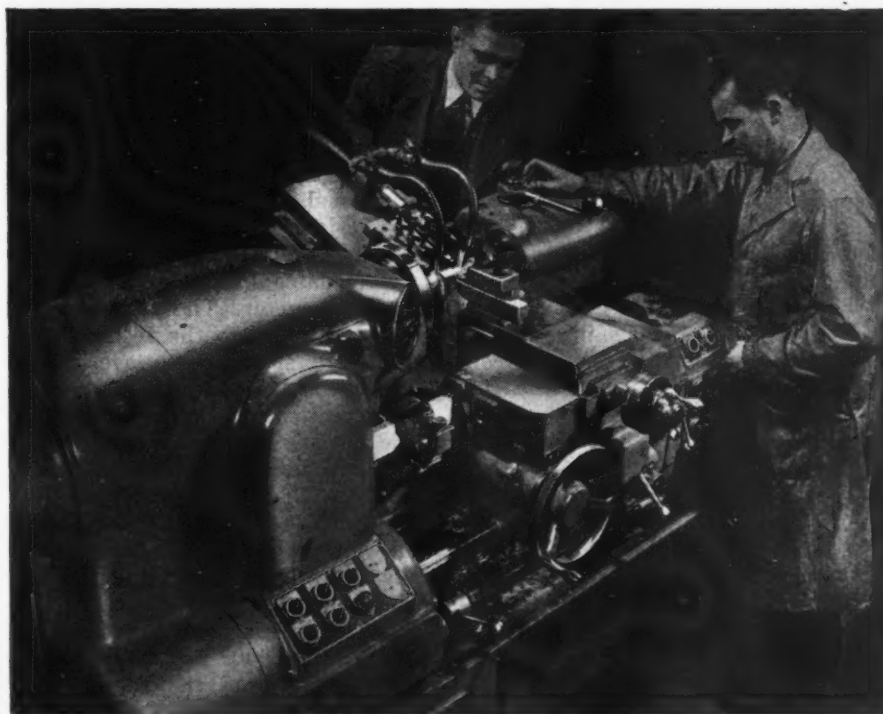
rapid traverse return. The slide has a rapid traverse, toward or away from the cut, of 100 inches per minute, and a feed rate of 1/2 inch to 13 inches per minute. The front carriage can pass or be traversed past the tailstock base, which can be clamped anywhere along the rear ways of the lathe bed.

The rear carriage, for facing and necking work, has its own motor, an electrically controlled cycle, and feeds which can be changed through pick-off gears. It has forward and return power-driven rapid traverse, and requires no mechanical tie-up with the front carriage.

Either alternating- or direct-current drive can be used for operating the headstock, depending on the type of work. The spindle has an A-1 6-inch flanged type nose for direct mounting of chucks and drive plates. Provision is also made on the spindle for mounting different types of air equipment, such as cylinders and draw-rods and air-operated work-drivers.

Fig. 1. (Left) The "Mona-Matic"—a Manually Operated or Semi-automatic Machine for First- and Second-operation Work

Fig. 2. (Above) The Monarch "Uni-Matic" for Precision Turning, Facing, and Boring Operations on a Production Basis



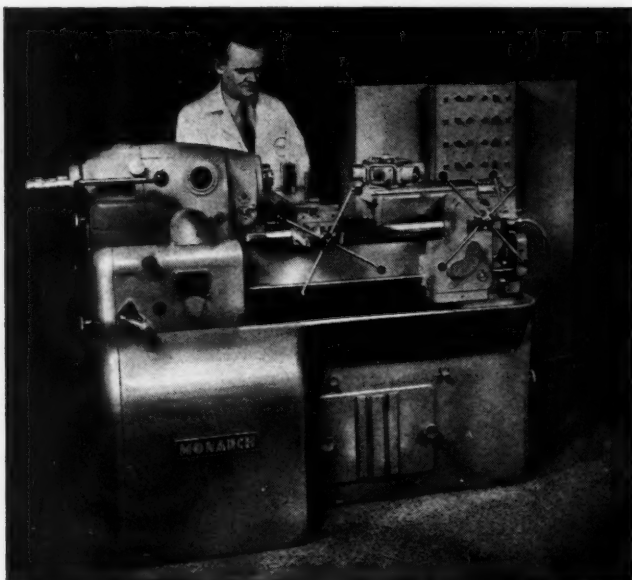


Fig. 3. The "Speed-Matic," a High-production Manufacturing Hand Screw Machine

A new system of headstock lubrication is used, by which a small quantity of oil, first reduced to such finely divided particles as to be little more than a "mist," is circulated to keep all working parts cool even when the lathe is operating at a spindle speed of 3000 R.P.M.

The "Uni-Matic" Turning Machine

Another of the new machines—the "Uni-Matic"—shown in Fig. 2, is radically different in design from the usual engine lathe. It is intended for turning, facing, and boring operations on a production basis with great accuracy.

The machine consists essentially of two members: (1) A simplified conventional lathe base and headstock, with change-gears, motor, and driving mechanism; and (2) from one to three specially designed tool-slides mounted on T-slotted swiveling bases, permitting them to be set at almost any angle. These tool-slides, known as "Uni-Mats," are basically individually motor-driven compound rests, which can be grouped about the spindle end in whatever arrangement will best facilitate the application of the cutting tools.

The electrically controlled alternating-current motor of each "Uni-Mat" traverses the main slide of the device at 100 inches per minute until automatically slowed down to the predetermined feeding rate for the remaining part of its total travel of 4 inches. At the end of the feeding cycle, it can immediately revert to the 100 inches per minute rapid traverse return or dwell a given number

of seconds before returning to the starting point. Feeds from 1/2 inch to 13 inches per minute are available. The "Uni-Mat" can also be furnished driven by a direct-current motor, in which case, with two sets of change-gears, the entire feeding range can be obtained through the change-gears and the variation in speed of the motor.

The "Uni-Mat" slides are built in two models—one equipped with tool relief for the returning tool and the other with a solid top slide. On the model equipped with tool relief, as soon as the "Uni-Mat" starts its cycle, the tool moves 0.031 inch closer to the work. By a slight internal adjustment, the tool relief can operate in whatever direction is required by the character of the cut, so that it is applicable to turning, facing, and boring operations. When the feeding portion of the cycle has been completed, the tool relief moves the tool away from the work 0.031 inch, and then the rapid traverse returns the slide to the starting point.

The "Uni-Mats" can be applied to work from 1 to 16 inches in diameter. Since they are all electrically controlled, timing devices can be utilized to maintain any required relation between the cycle of one "Uni-Mat" and that of another.

Three different spindle speed ranges are available from one motor for the main spindle drive, with maximum speeds of 1000, 2000, and 3000 R.P.M. Still higher speeds up to 5000 R.P.M. can be furnished for special requirements. When an alternating-current motor is used, the spindle will stop in slightly over one second,



Fig. 4. Monarch Improved Model EE Sensitive Precision Toolmaker's Lathe

operating at 3000 R.P.M. Similarly, when the main drive motor is directly connected to the spindle, the latter will reach 3000 R.P.M. in slightly over one second.

While this machine is specifically designed for single-purpose large-quantity production, it can be applied, with slight alterations in the electrical control, to smaller quantity production and still provide maximum output.

"Speed-Matic" Manufacturing Lathe

Fig. 3 shows a Monarch 10-inch high-production hand screw machine, known as the "Speed-Matic," having power-feed ram type turret, hand-operated cut-off slide, and pre-selected spindle speeds ranging from 50 to 5000 R.P.M. This machine is designed to handle small turning work in quantities of 25 to 500 with exceptional speed. The spindle has a D-1 3-inch American cam-lock mounting. The bore of the spindle accommodates bar stock up to 7/8 inch in diameter. The gear-box provides two feeds to the feed-rod, obtainable by shifting one lever.

Six feeds are built into the power-feed turret, which, multiplied by the high and low feed in the main gear-box, gives a complete range of twelve feeds to the turret-slide ranging from 0.0005 to 0.016 inch per revolution. The turret-slide is either manually operated or power-fed through a rod connecting with the main gear-box. The turret indexes to six stations within 0.0002 inch at a distance of 2 inches from the face of the turret.

The machine has a self-centering ball-bearing cut-off slide with front and rear blocks for holding tools which are fed to the work by a hand-wheel. Upon completion of the operation, the self-centering slide is returned to its original position by a spring and helical rack mechanism. The spindle speeds for each face of the turret, as well as for the cut-off slide, are preselected by means of potentiometers.

Improved Precision Toolmaker's Lathe

The Monarch Machine Tool Co. has also placed on the market an improved 10-inch sensitive precision toolmaker's lathe, known as Model EE. (See Fig. 4). The improvements incorporated in this design are as follows: It has higher sustained operating speeds, due in part to design changes that facilitate more complete lubrication of gears and moving parts. The apron bearings, bed and carriage ways, and cross-slide are provided with force-feed lubrication; the end gears are totally enclosed and run in oil. It is not necessary to change end gears to obtain the full range of feeds and threads. A single lever at the front of the gear-box shifts from belt drive (with fifty feeds) to end gearing (for cutting sixty different pitches).

Another innovation is the thread-chasing mechanism, which provides independent adjustment to the cross-slide when desired, even though working against a positive metal-to-metal stop. The half-nut lever has been repositioned, and now operates in the same direction as the cross-feed and longitudinal-feed levers. The electrical equipment, while enclosed in the lathe base, has been mounted separately from other equipment, such as pumps, to simplify inspection or removal. Similarly, all electric switches and connections for the lead-screw reverse are brought out to a box on the tailstock end of the lathe, where they can be easily reached. The threading and feeding mechanisms are interlocked, so that they cannot be started together.

Mold-Maker's Tool-Room Lathe

Another Monarch machine is a new type of universal tool-room lathe, Fig. 5, developed specifically for mold-makers. This lathe is available in a size corresponding to a 12-inch tool-room lathe, swinging $14\frac{1}{2}$ inches over the bed, with a distance between centers of 30 or 54 inches. The additional features of the machine in no way interfere with the performance of all regular types of

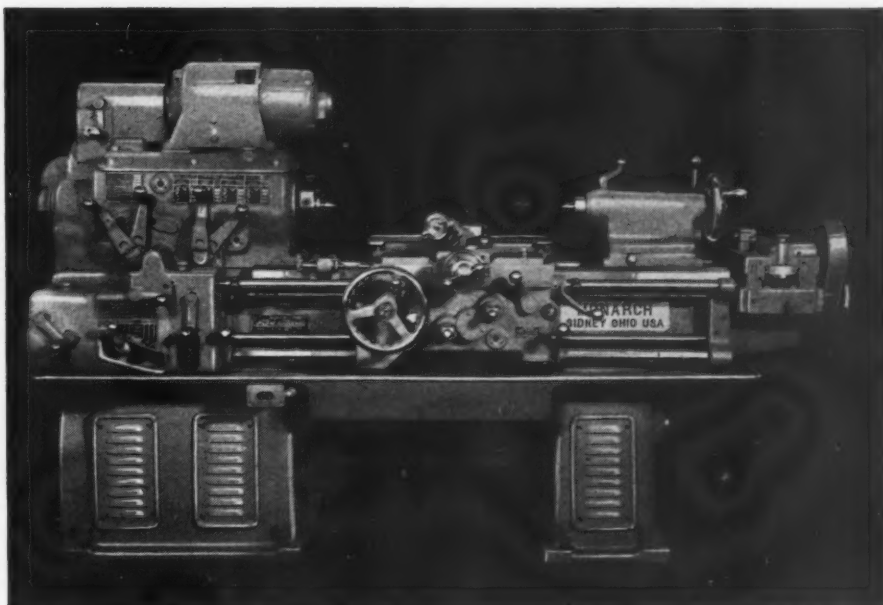


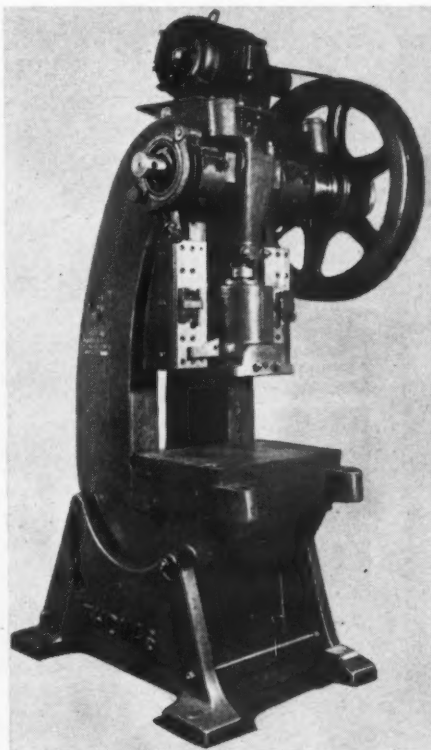
Fig. 5. The Monarch Mold-maker's Tool-room Lathe

toolmaking work. There are, however, two important features especially added for the mold-maker.

One of these features is an adjustable lead-screw varying mechanism which can be adjusted to compensate for shrinkage of the material being molded. When a thread is required in the mold and great accuracy is demanded in the finished product, the lead of the thread must be adjusted to the shrinkage of the mold

material. If this shrinkage is 3 per cent, the lead-screw varying mechanism can be set accordingly. If the shrinkage should be only 0.001 inch per inch, the lead-screw varying mechanism can be set to compensate for this small amount of shrinkage. After setting this mechanism, the thread is chased in the mold as usual.

The second special feature is a speed reducer which can be mounted on top of the headstock, and connected at will. This device permits speeds as low as a fraction of a revolution per minute, and is used for miscellaneous internal and external milling operations which can be performed at a single setting of the mold in the lathe. _____ 61



Open-back Inclinable Press Built by Thomas Machine Mfg. Co.

Thomas Inclinable Press

The Thomas Machine Mfg. Co., Pittsburgh 23, Pa., is producing a new series of open-back inclinable presses of 50, 75, and 100 tons capacity in which numerous improvements in design, construction, and operating facilities are incorporated. Construction features include a one-piece forged, high-carbon steel crankshaft of exceptionally rigid design, which has ground and polished bearing surfaces. The unusually large bronze-bushed main bearings are of the 45-degree split type designed to transmit the thrust directly to the semi-steel frame.

The flywheel hub is so designed that the tool-steel driving and backing blocks can be easily replaced when worn. The massive pitman is

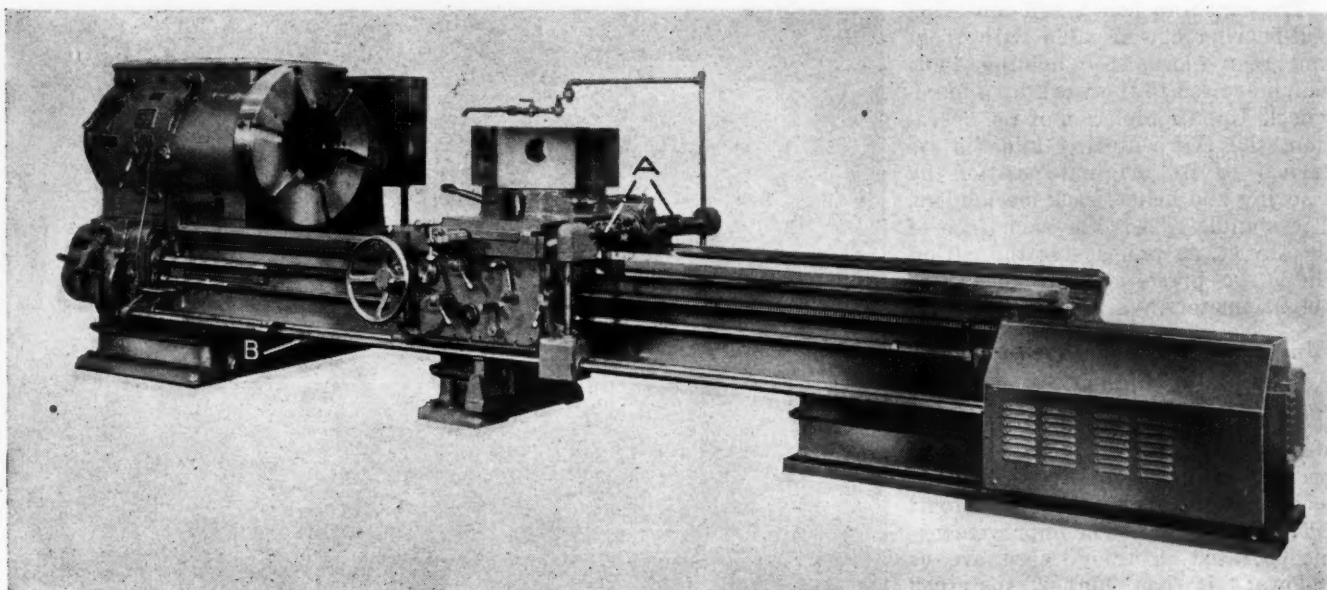


Fig. 1. Hydratrol Lathe Equipped with Automatic Turret-feed Regulator and Automatically Positioned Feed-stops

connected to the slide by a heavy screw of the ball-and-socket type. A patented safety clutch permits single-stroke, non-repeat, or continuous operation at the will of the operator. Means are provided for locking these presses to prevent accidental operation when setting the dies.

All clutch parts are interchangeable, and those subject to wear are made of heat-treated alloy steel. A safety stop incorporated in the shaft prevents accidental dropping of the

slide should the brake fail to stop the shaft at the top center position. Provision is made on all presses for a

knock-out bar. Lubrication is provided for the full bearing length of the gibs. 62

Lehmann Hydratrol Lathe with Automatic Feed Regulator and Automatically Positioned Stops

A 36-inch swing Hydratrol lathe with a 16 1/2-inch spindle hole and a 24-inch hexagon turret, recently brought out by the Lehmann Machine Co., 3560 Chouteau Ave., St. Louis 3,

Mo., is shown in Fig. 1. This machine is fitted with an automatic turret-feed regulator and has automatically positioned longitudinal and cross-feed stops, as seen in the illustrations.

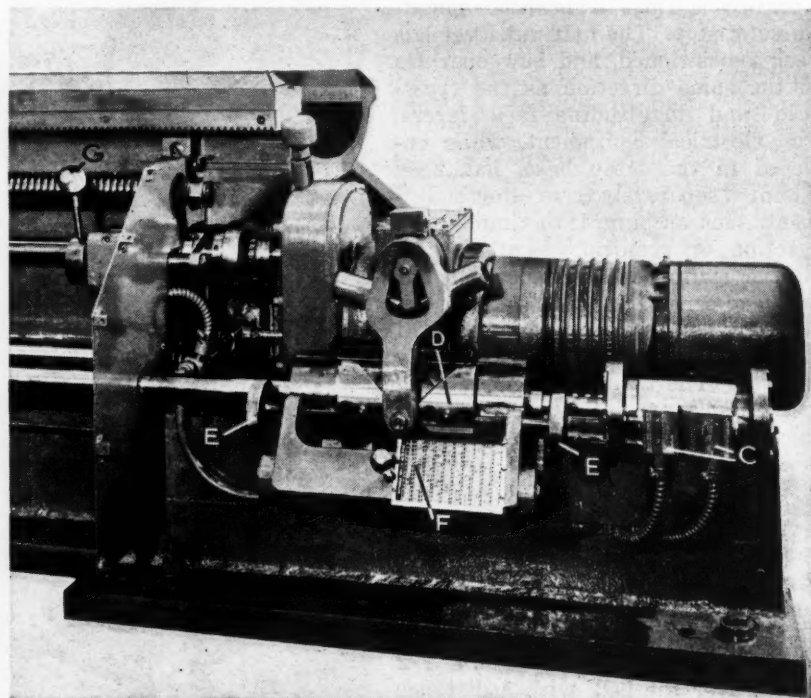
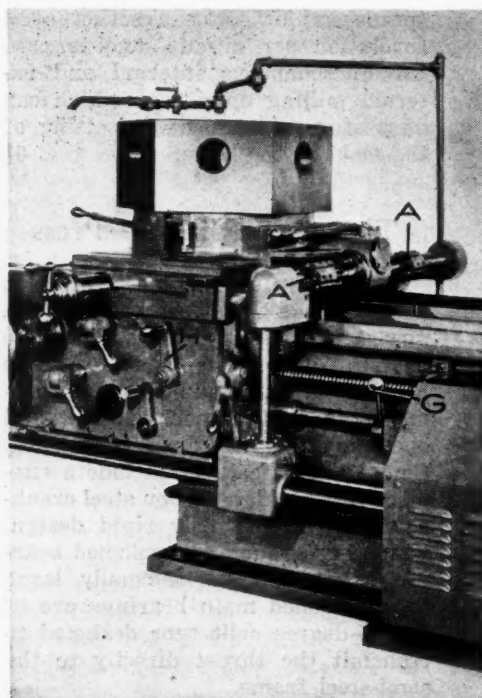


Fig. 2. (Left) Hexagon Turret of Hydratrol Lathe with Automatic Feed Regulator and Automatically Positioned Longitudinal and Cross-feed Stops. Fig. 3. (Right) Close-up View of Drive for Automatic Feed Regulator with Longitudinal and Cross-feed Stops Used on the Hexagonal Turret Lathe Shown in Fig. 1

Indexing the turret of this lathe accomplishes four things: (1) It brings a new turret face into the work area; (2) it indexes a set of front and rear cross-slide positioning stops shown at A, Figs. 1 and 2; (3) it indexes a set of longitudinal stops that can be used either for positioning a cross-feed cut or as a precision longitudinal-feed stop (shown at B, Fig. 1) operating a magnetic brake on the feed-rod drive through the action of the Micro limit switches shown at C, Fig. 3; (4) it automatically regulates the rate of feed by means of the six-position, rotary cam shown at D, Fig. 3. The feed-regulating cams for each turret face are independently adjusted through a wide range by screws E.

The automatically regulated feed-rod drive does not interfere with the operation of the standard lathe quick-change gear-box, either for feeding or threading. The handle G, Figs. 2 and 3, is used to disengage the automatic drive, and is electrically interlocked to prevent the simultaneous application of power through both drives. Threads can be cut with the

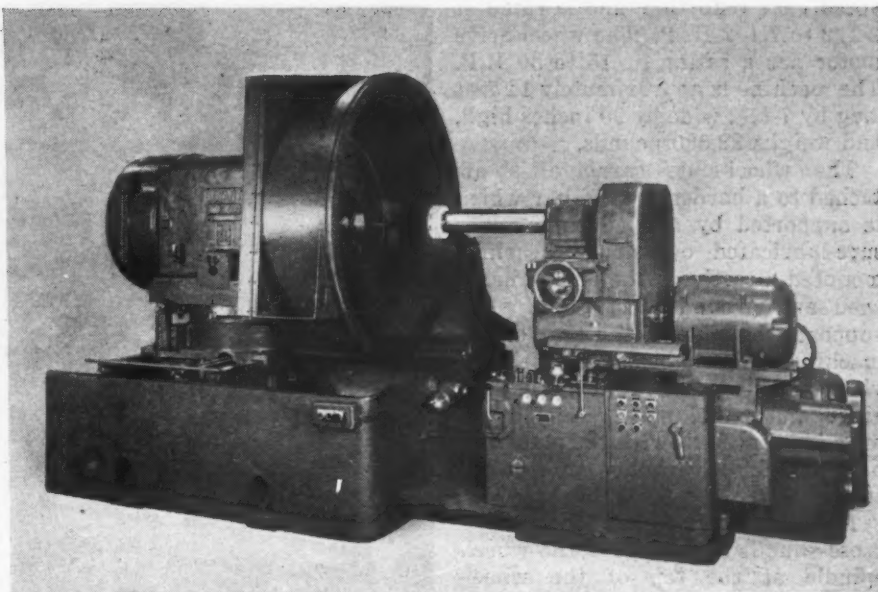


Fig. 1. Large-swing Internal Grinder Built by Bryant Chucking Grinder Co.

turret, using the lead-screw without disengaging the automatic drive. This is accomplished by engaging the half-nut through handle H, Fig. 2...63

The distance from the work-spindle flange to the wheel-slide is adjustable from 25 to 45 inches. A wheel-slide cross-travel of 8 inches is available. The work-head has a cross-adjustment of 16 inches toward the front, and of 14 inches toward the rear. The work-head has a swivel adjustment of from 0 to 60 degrees, the maximum included angle which can be ground with the full 60-inch swing being 60 degrees.

Four work-spindle speeds of 15, 25, 35, and 50 R.P.M. are available. The work-driving motor has a four-

Bryant Internal Grinder

A large No. 150 internal grinder with a total swing of 60 inches, a grinding stroke that permits grinding holes to a maximum depth of 14 inches, and a maximum traverse stroke of 19 inches has been developed by the Bryant Chucking

Grinder Co., Springfield, Vt. A general view of the front of this new grinder is shown in Fig. 1, while Fig. 2 shows a rear view of the machine from the right-hand end, and Fig. 3 a view of the machine from the left-hand end.

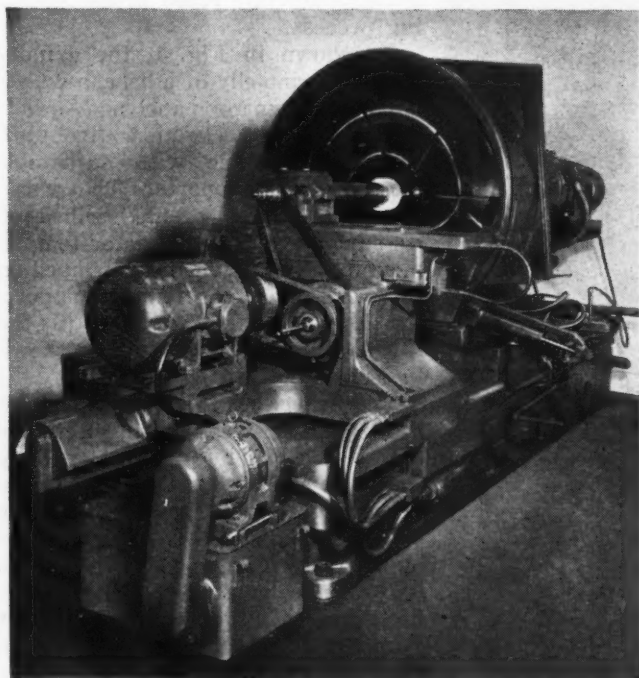


Fig. 2. Rear View from Right-hand End of Grinder Shown in Fig. 1

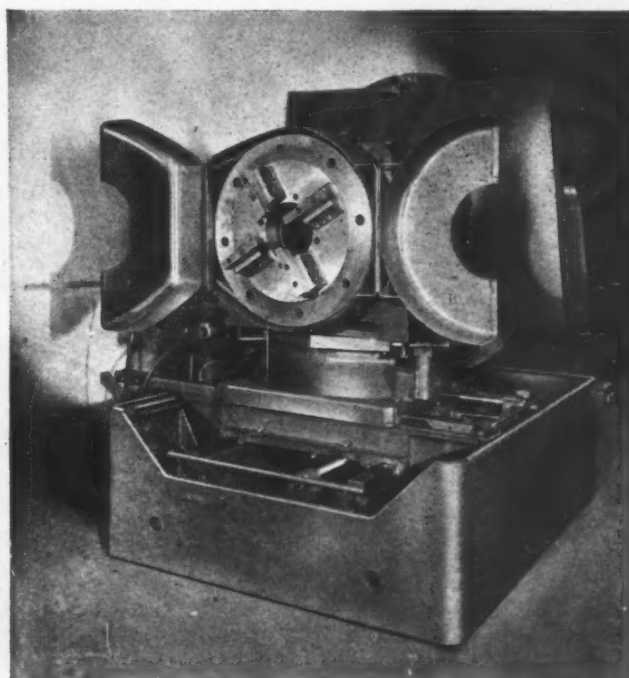


Fig. 3. Bryant Internal Grinder as Viewed from the Left-hand End

speed gear reduction, and is rated at 2 1/2 to 7 1/2 H. P. The wheel-drive motor has a rating of 15 to 30 H.P. The machine is approximately 14 feet long by 7 feet wide by 90 inches high, and weighs 22,000 pounds.

The wheel-slide carriage is attached to a hardened steel bar which is supported by and slides in pressure-lubricated cylindrical bearings mounted directly on the bed. A hardened and ground steel guide plate supports the slide at the rear of the machine. Roller bearings are provided at this point between the carriage and guide plate. A cylinder, machined integral with the slide bar, provides for hydraulic longitudinal traverse of the wheel-slide.

A preloaded anti-friction bearing cross-slide is provided for the wheel-spindle at the top of the wheel-slide carriage. Both hand and power cross-feeds are available, and a hydraulic cylinder serves to move the wheel-head to the rear for plugging or gaging the hole when the wheel-slide is moved to the extreme right.

The wheel-spindle bracket can be mounted in different positions on the cross-slide to accommodate large- or small-diameter grinding of either internal or external work. The heavy-duty work-head has a preloaded ball-bearing spindle with a 9-inch hole. A faceplate or any other suitable fixture can be attached to the front of the spindle, and provision is made for mounting faceplate jaws at the rear of the spindle. _____64

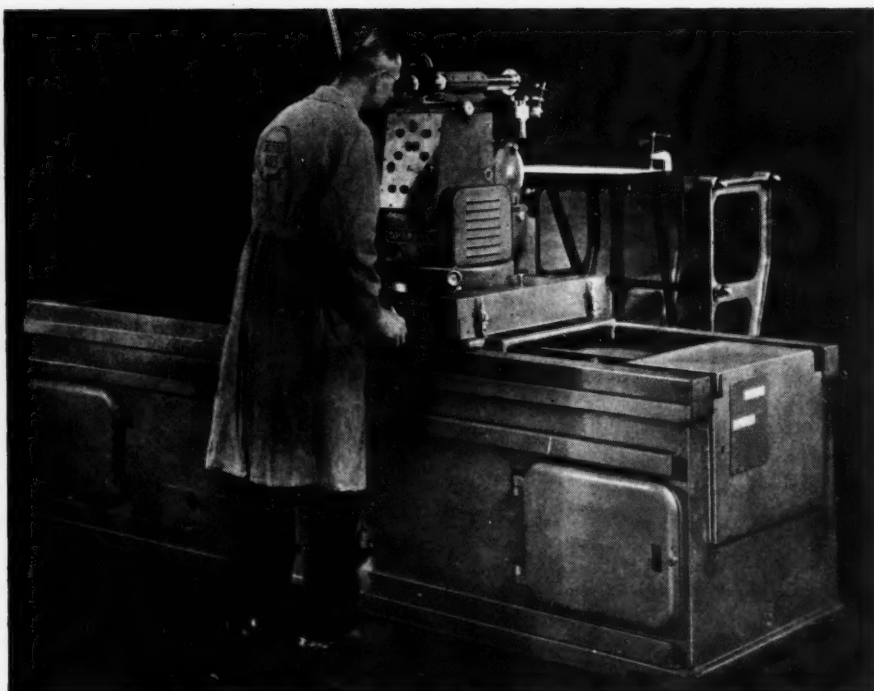


Fig. 1. Templet Profile Grinder with Electronic Control Developed by the Sheffield Corporation

Sheffield Templet Grinder with Electronic Control

A templet grinder equipped with electronic control for the precise grinding of templets and other work up to 72 inches in length, 8 inches wide, and 1 inch thick without repositioning has been developed by the Sheffield Corporation, Dayton 1, Ohio. This machine was originally

designed for grinding templets used in laying out and checking automobile body dies and the parts produced by the dies. As many as eight of these templets, each approximately 1/8 inch thick, can be ground at one time. Templets for many other purposes, including those used in aircraft fuselage and wing manufacture, can be made at comparatively low cost by this rapid profile grinding process.

As shown in Fig. 1, the grinder consists primarily of a base, a wheel-head with control panel and optical equipment, an electronic control unit, and a work-table with adjustable parallel work-supports. The work, with the desired profile scribed on its surface or with a master templet mounted directly on it, is clamped on the work-table. The templet-supporting parallels are adjusted to the rough outline of the work, as shown in Fig. 2.

The wheel-head is positioned on the transverse ways by the electronic controls to bring the wheel opposite the point at which the grinding is to commence. Axial movement of the work-head can also be accomplished by turning a knurled knob to the left of the handwheel. The wheel-head can be adjusted on the turret a maximum of 40 degrees each side of center to meet any conceivable requirement for positioning caused by shoulders and other irregularities of the profile to be ground.



Fig. 2. Rear View of Templet Grinder, Showing Work Mounted on Adjustable Parallel Supports

After the work is properly located, the grinding-wheel reciprocating slide is adjusted for the required vertical stroke, the range of adjustment being from 0 to 1 1/4 inches. The reciprocating speed can be set at either 50 or 100 strokes per minute.

The grinding wheel is advanced to the work by means of a cross-slide feed handwheel. Either a fast or a slow feed can be selected. The operator views the work through a 20-power microscope in setting the wheel up to the work and in performing the grinding operation. He controls the machine so that the microscope cross-hairs are guided along the lines scribed on the work by means of the cross-slide handwheel as the wheel-head continues its traverse. Four different reticules having diameters of 0.005, 0.0075, 0.010, and 0.015 inch are provided with the microscope to meet the varying degrees of accuracy required by different classes of work. ----- 65

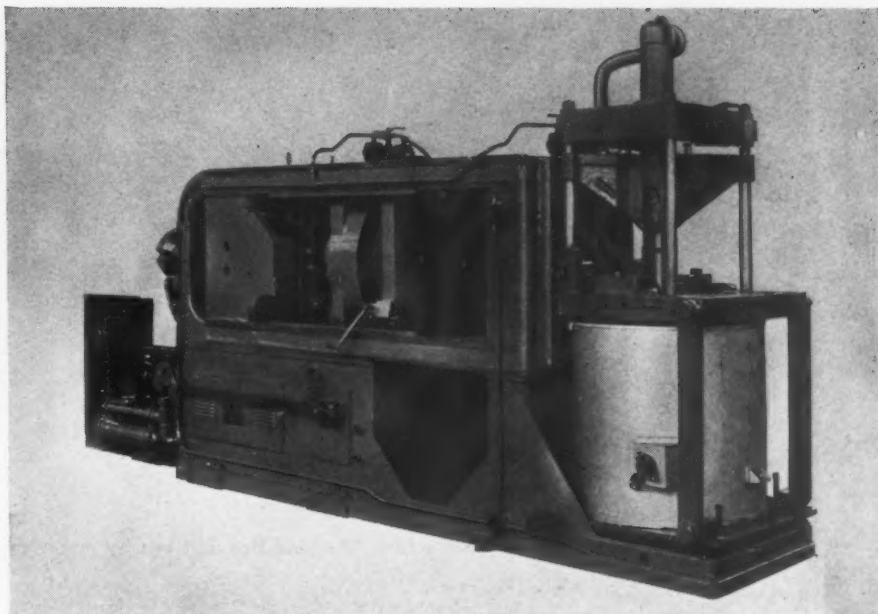


Fig. 1. Lester-Phoenix Improved Die-casting Machine Equipped for the Production of Zinc Castings

Lester-Phoenix Improved Die-Casting Machines

Two improved die-casting machines designed for the production of large heavy castings have just been announced by Lester-Phoenix, Inc., 2711 Church Ave., Cleveland 13, Ohio. The Model HP-3 1/2-SF machine for producing zinc, tin, and lead alloy die-castings, with a capacity for making zinc castings weighing as much as 19 pounds each, is shown in Fig. 1. The Model HP-3 1/2-X-SF machine, equipped for making aluminum, brass, and magnesium die-castings, which will produce aluminum castings

weighing up to 14 pounds each, is illustrated in Fig. 2.

An important feature that these two machines have in common is a one-piece cast-steel frame of exceptional rigidity. The cross-sectional area of the frame is 240 square inches. The locking pressure available within this frame is conservatively rated at 600 tons.

The central die support of these machines has been increased in size, and the movable die-plate now has a bearing at all four corners. The dies

can be lowered through a long wide opening in the top of the frame. The die height can be easily and quickly adjusted by means of a single hand-crank. The die movement and die space on these machines has been increased 60 per cent, and the toggle linkage has been made stronger and simpler in design.

The aluminum die-casting machine is equipped with the patented Lester prefill injection system, which injects metal rapidly and then applies the greatest pressure to the metal while it chills in the die, squeezing out shrinkage voids, trapped air, and gases, and thus eliminating porosity in the finished castings. This equipment develops an injection pressure of 33,000 pounds per square inch when applied to a casting having a projected area of 40 inches. Higher pressures per square inch can be applied to smaller castings.

The hot-metal injection system of the zinc die-casting machine has a one-piece cylinder and gooseneck casting of heat- and corrosion-resistant alloy semi-steel with a high-speed steel cylinder liner and plunger. The hot metal is held under the injection pressure while it chills in the die. ----- 66

Redmer Air-Operated Collet Chuck

The Redmer Air Devices Corporation 601 W. Washington Blvd., Chicago 6, Ill., has added to its line a new No. 10 collet air chuck. This

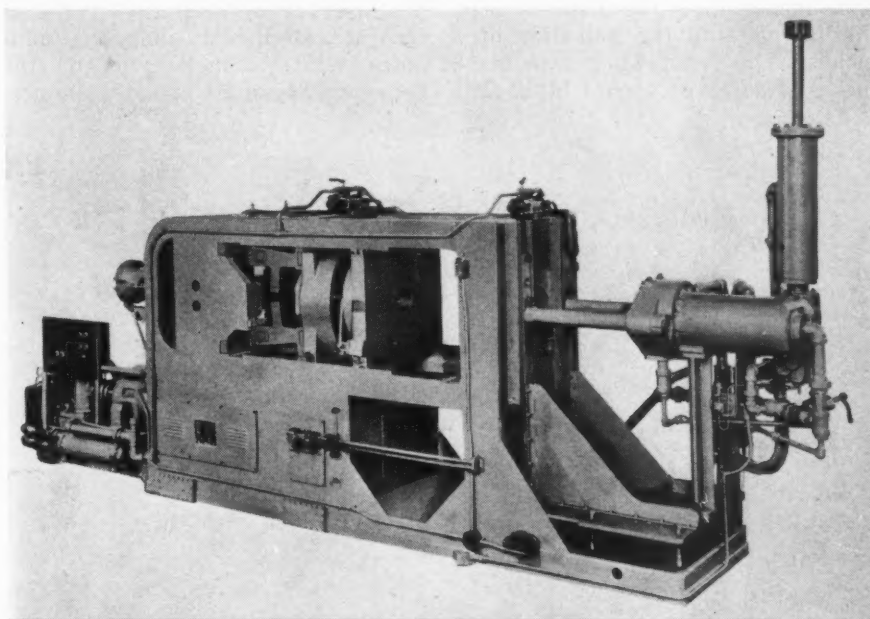


Fig. 2. Lester-Phoenix Machine Equipped for Making Aluminum, Brass, and Magnesium Die-castings

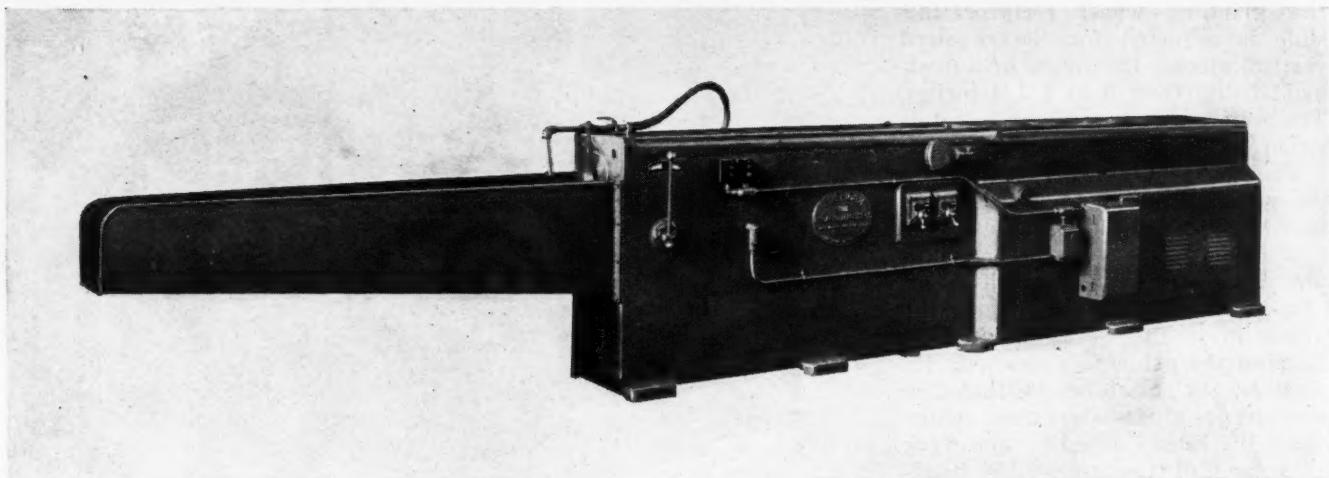


Fig. 1. Heavy-duty Broaching Machine Brought out by American Broach & Machine Co.

chuck is the same size as the No. 00, but will use No. 10 collets, like those employed on Brown & Sharpe high-speed automatics.

By the use of an adapter sleeve

and nose cap, the No. 10 chuck can be arranged to take the regular 00 collets. This gives the small compact collet air chuck an increased capacity of from 1/16 to 1/2 inch. 67

smaller machine, when equipped with the outer support, occupies a floor space of 2 1/4 by 24 feet, while the larger machine occupies a space of 2 1/2 by 24 feet. 68

Horizontal Broaching Machine

A new type of horizontal broaching machine designed for heavy-duty internal broaching operations and for handling many surface broaching jobs has been announced by the American Broach & Machine Co., Division of Sundstrand Machine Tool Co., Ann Arbor, Mich. This Type HD machine has a rolled wall construction which, in effect, forms double walls throughout the bed.

It is made in two standard sizes—the HD-15-66 having a normal capacity of 15 tons, and the HD-20-66 having a normal capacity of 20 tons. The 15-ton machine has a maximum capacity of 19 tons, a broaching speed

which is variable from 15 to 29 feet per minute, a return speed of 41 feet per minute, and weighs 9000 pounds.

The 20-ton machine has a maximum capacity of 28 tons, a broaching speed which is variable from 14 to 20 feet per minute, a return speed of 28 feet per minute, and weighs approximately 10,000 pounds.

Both machines have a maximum stroke of 66 inches, and take broaches up to a maximum length of 72 inches. Each has a 7-inch bore in the faceplate and a minimum distance from the faceplate to the pull-slide of 5 inches. The front work face is 18 inches wide by 41 inches high. The

Enco Lathe Turret with Double Drive

A new bed turret for lathes with swings up to 14 inches has been added to the line of turrets and multiple tool-holders made by the Enco Mfg. Co., 4522 Fullerton Ave., Chicago, Ill. This new unit, known as the "Hexturret," is equipped with double steel drive gears and double racks to equalize the feed applied to the turret-slide, a rack being secured to each side of the slide close to the bearing surfaces. This twin drive serves to keep the turret in accurate alignment and thus minimize wear. Double gibs of the heavy-duty type are employed to per-

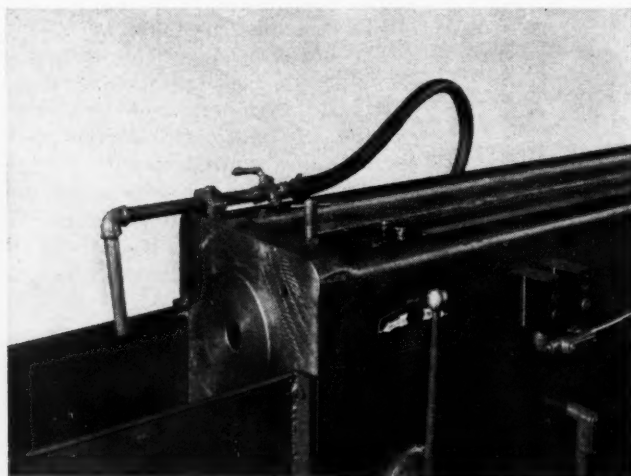
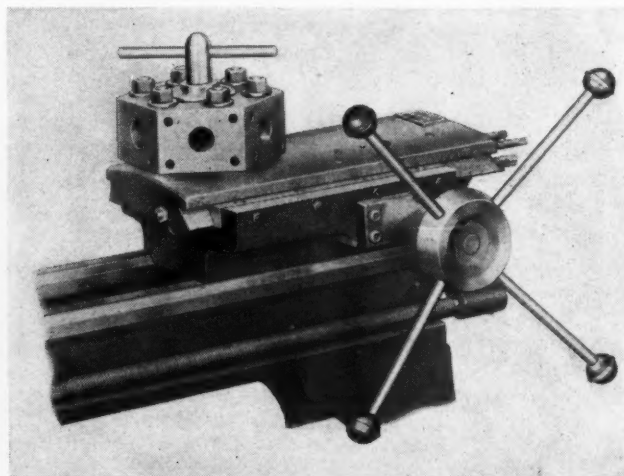


Fig. 2. Close-up View of Front Face of Broaching Machine Shown in Fig. 1



Turret and Base Attachment for Lathes, Made by Enco Mfg. Co.

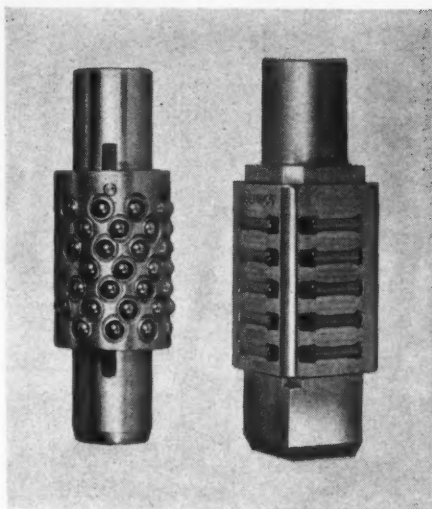


Fig. 1. Lempco Anti-friction Guide Pins for Die Sets

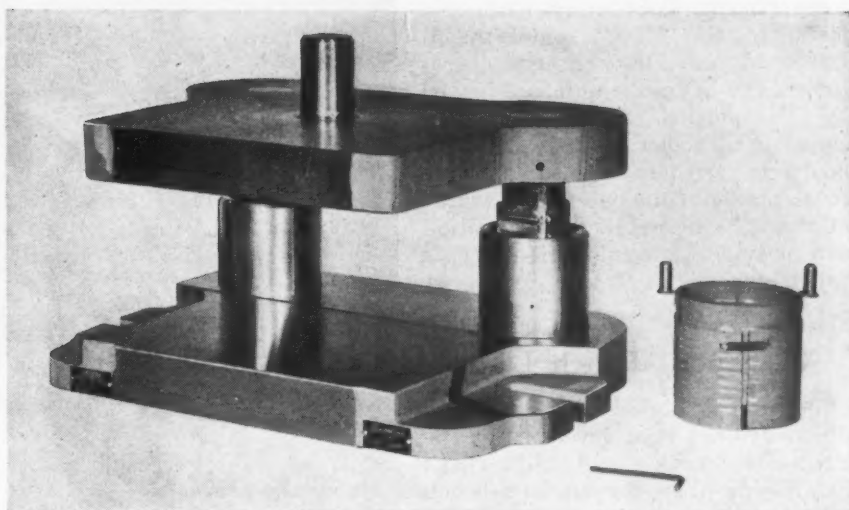


Fig. 2. Lempco Anti-friction Die Set with Roller-bearing Guide Pins and Adjustable Metal Guard

mit adjustment at either the front or rear dovetail bearing.

The "Hexturret" head is arranged to facilitate the accurate mounting of flanged tools and tool-holders. Other features include clearance on the turret base for the lathe saddle wings, which permits feeding the turret-slide close to the headstock; and a safety clamp designed to prevent "crawling" of the turret. 69

Lempco Precision Anti-Friction Die Sets

The Industrial Division, Lempco Products, Inc., 5509 Dunham Road, Bedford, Ohio, has developed a die set with anti-friction guide pins designed to prevent "freezing" due to the friction developed at the exceptionally high speeds at which their improved punch press can be operated. The ball and roller bearing types of die-set guide pins illustrated, although originally designed for use on the Lempco high-speed punch presses, can be used to advantage wherever ordinary die sets are employed. The round-pin style (at the left, Fig. 1) is equipped with ball bearings, and the square-pin model (at right) with roller bearings.

After a test run of 18,000,000 strokes under more difficult than normal conditions, 0.0005 inch preload remained of the original 0.0015 inch preload applied to both the round- and square-pin models. This means that the play between guide post and bushing is kept to an absolute minimum, as required to insure maximum accuracy and insure longer life for the die and greater production between die grinding or

sharpening operations. Another important advantage claimed for this new development is the reduction in the die setter's time because of the

ease with which the die sets can be opened and closed by hand, without the use of jacks, bars, or similar tools. 70

Cleveland Die-Casting Machine

Complete elimination of cold metal from the "shot" furnace, improved hydraulic performance, automatic timing, and improved adjustable bearings for the movable platen are outstanding features of a new die-casting machine announced by the Cleveland Automatic Machine Co., 2263 Ashland Road, Cleveland 3, Ohio. This new Model 400 machine is available for the production of zinc, tin, lead, magnesium, aluminum, bronze, and brass die-castings.

Although the basic Cleveland design has been retained, including the interchangeability of hot metal ends, the appearance of this machine is entirely different from that of previous models. All toggle and pump mechanisms are now entirely enclosed, and the new streamline guards can be easily removed to permit access to the working parts.

A double compartment furnace on the zinc, tin-lead machine, with separate automatic burners for each

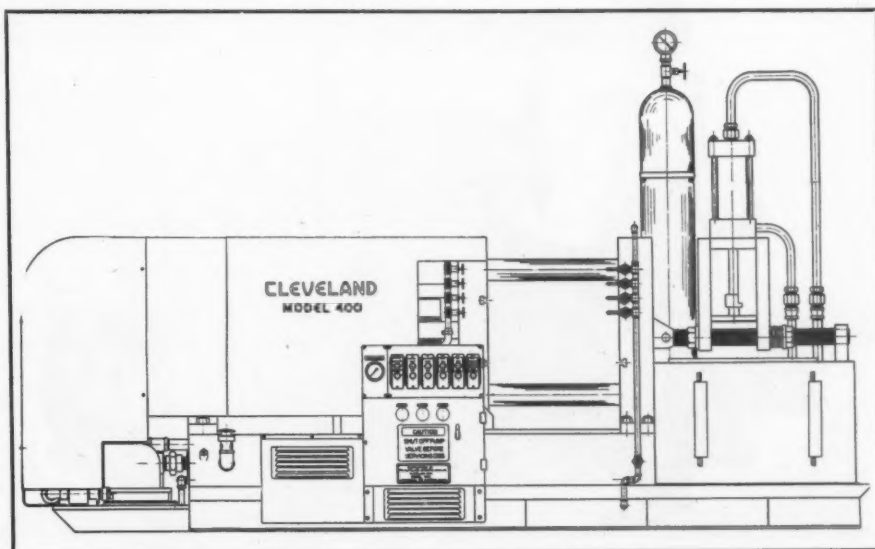


Diagram of Universal, High-pressure, Hydraulic Die-casting Machine Brought out by the Cleveland Automatic Machine Co.

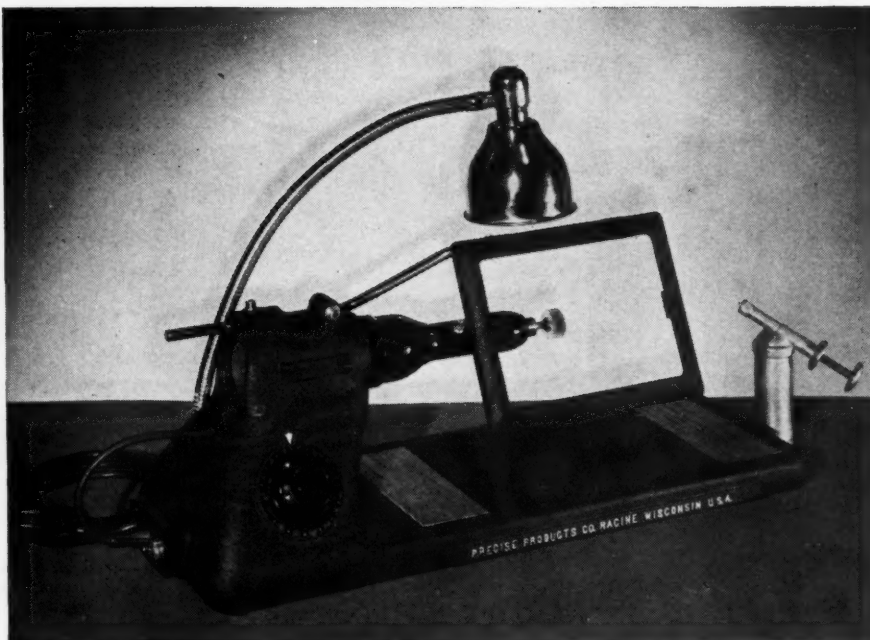
compartment, does away with cold metal in the "shot" compartment. Improved uniformity in the operation of the hydraulic unit is achieved by the addition of a new heat-exchanger oil cooler. The water flow heat absorption is augmented by fin construction of the outer shell, which affords a high rate of heat radiation and provides a combination of air and water cooling. _____71

Vari-Speed Bench Lathe

The small high-speed lathe here illustrated has been developed by the Precise Products Co., 1328-30 Clark St., Racine, Wis., for use on a bench or table. It is designed to increase accuracy and speed in grinding, finishing, and polishing small products and parts of steel, non-ferrous metals, plastics, glass, wood, etc.

Power is furnished by the manufacturer's Precise-35 electric grinder and "Handtool." The lathe unit has a built-in speed control which provides a range of working speeds from 0 to 40,000 R.P.M., any of which can be obtained by simply adjusting the control dial. The power unit can be used separately as a hand tool for grinding, milling, deburring, finishing, and polishing.

The lathe stand is of cast aluminum. Two large recessed compartments provide storage space for rotary tools. An adjustable safety glass shield protects the operator, and a lamp mounted on a flexible



Vari-speed Bench Lathe Developed by Precise Products Co.

arm illuminates the entire operating field. A pressure grease gun provides means for quick lubrication of all four high-speed ball bearings.

Applications for which this tool is specially well adapted include the deburring, finishing, and polishing of

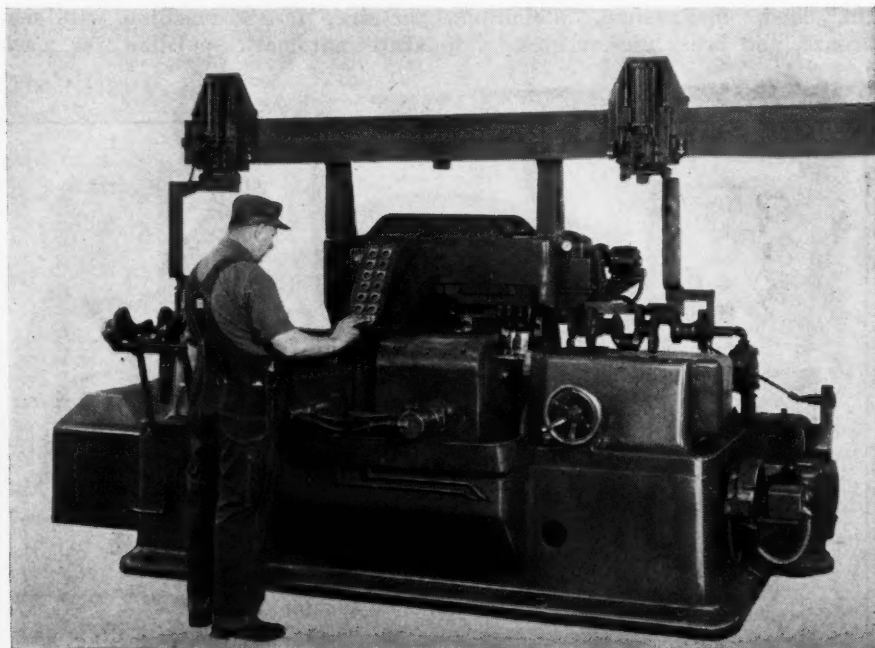
small screw machine parts, and the finishing of precision castings, carbide tools and blanks, the precision grinding and polishing of jewelry, and general grinding and polishing where speed, accuracy, and convenience are essential. _____72

Wickes Automatic Crankshaft Turning Lathe

A new high-production rough- and finish-turning center-driven crankshaft lathe has just been placed on

the market by Wickes Brothers, Saginaw, Mich. This Model CH-4 machine is designed to perform the turning operations on all main-line bearings and ends of automotive and similar crankshafts prior to hardening or finish-grinding. It is equipped with hydraulic feed, and is completely automatic in operation; first the main-line bearings are rough-turned with divided tools in both the front and rear positions, and then the finishing tools are automatically shifted into position, the finish-turning being done with tools located in front and rear positions.

Loading and unloading of the work are accomplished by a power-operated device. The machine is equipped with a synchronized variable speed and feed mechanism to maintain both the surface speed and tool feed at the maximum permissible rates throughout the operating cycle. The new lathe is designed with a view to obtaining extreme rigidity and insuring a high degree of accuracy. Other new features have been incorporated in the design to provide greater convenience in loading, chucking, etc. The machine weighs approximately 30,000 pounds. _____73



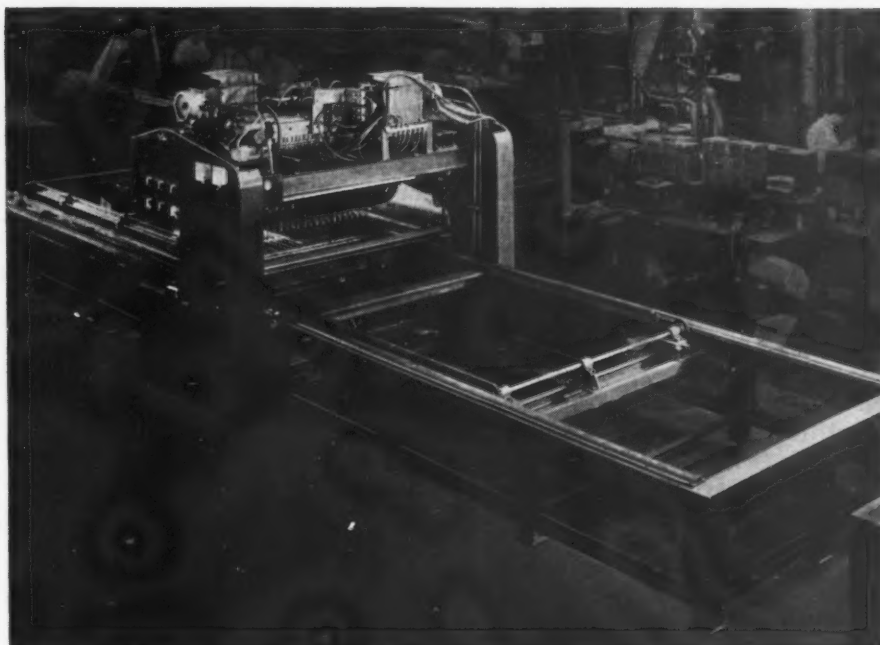
Automatic Center-driven Crankshaft Turning Lathe Brought out by Wickes Brothers

"Ultra-Speed" Welder Control Unit

The Progressive Welder Co., 3050 E. Outer Drive, Detroit 12, Mich., has recently built a new "Ultra-Speed" welder control unit which permits assembly welding operations to be performed at rates up to 900 spot-welds per minute. With this control, the welding current can be distributed to a single welding point or to groups of welding points successively by means of a screw-driven carriage that depresses push-rods which engage the proper electrical contacts. At the same time, another element of the carriage engages adjustable-stroke plungers which control individually the length of time the current flows to each weld.

All welding points bear on the work simultaneously under welding pressure before the first weld is formed, and remain thus until the last weld is completed, eliminating the separate "squeeze" and "hold" periods usually required for each weld. Thus twenty, fifty, and one hundred or more joints can be welded almost as quickly as one joint.

"Ultra-Speed" controlled machines can be built to accommodate an almost unlimited range of work with respect to spacing and location of the welds. This equipment is particularly adapted for use in the production of automotive, refrigerator, and stove sub-assemblies, which are sometimes composed of many parts. The weld-



Automatic Spot-welding Machine Equipped with "Ultra-Speed" Control Unit

ing guns can be arranged in single or multiple rows; circular, step, or curved formations; either closely spaced or spanning the full width of large panels. Individual timing for each welding gun permits the spot-

welding of different thicknesses of metal in one complete operation. The illustration shows a typical "Ultra-Speed" machine used for automatic assembly welding of complicated panels of various lengths. —74

Rockwell Automatic Pusher Type Normalizing Furnace

A new pusher-tray type of normalizing furnace designed for uniform heating and cooling of large cast-

steel truck rear-axle housings, which operates under practically automatic control, has been built by the W. S. Rockwell Co., 200 Eliot St., Fairfield, Conn. The axle-housing castings for which this furnace was designed are 64 to 66 inches long and weigh approximately 350 pounds. Small steel and alloy-steel castings can also be normalized with this equipment.

The furnace is designed to heat the castings to 1650 degrees F., hold them at this temperature for one hour and then discharge them on individual trays, where they are permitted to cool uniformly in the air. Thus every twelve minutes one tray with its load enters the heating zone of the furnace and one casting is discharged, the total normalizing time being forty-eight minutes in the heating zone and sixty minutes in the holding zone. A unique system which coordinates a time clock with the actuating mechanisms serves to raise the furnace doors, discharge the heated work, push in a new charge, and lower the doors in accordance with the predetermined operating cycle. The heating chamber of the furnace is about 15 feet long and 6 feet 5 inches wide. —75



Rockwell Normalizing Furnace with Pusher Mechanism

Gleason Quenching Press

The Gleason Works, 1000 University Ave., Rochester 3, N. Y., has brought out a No. 16 quenching press of an entirely new design for holding and quenching heated gears and other parts in such a manner that they can be hardened without distortion.

The press is designed for oil quenching only, and is air-operated. The dies are especially designed to handle the particular work or part to be quenched. They can be supplied for hardening bevel, hypoid, and spur gears, liners, bearing races, disks, and various other parts of symmetrical or non-symmetrical shape. Parts with outside diameters up to 15 inches can be hardened at a production rate of from 10 to 120 pieces per hour, depending on the size of the section and quench rate.

Operation of the press is entirely automatic. After placing the hot work on the extended lower die, the operator starts the cycle by pressing a button. This causes the lower die to swing back into the quenching position under the upper die, and the upper die-holder to begin its downward stroke. The upper die descends rapidly until it approaches the work, when it is automatically slowed down so that it contacts the hot work-piece gently. After engage-

ment, full pressure is applied to mechanically align the work while it is still in the plastic state.

As soon as the work is securely clamped, the flow of quenching oil around the piece begins. This flow continues according to a predetermined sequence of accurately controlled volumes and time intervals. The work is free to contract in the normal manner during this operation, but is prevented from warping or distorting.

At the end of a predetermined time cycle, the automatic time arrangement reverses the valves, the

upper die moves vertically to its upper position, and the lower die swings out to the unloading position.

A built-in pumping system and oil reservoir reduces the external oil supply required to approximately 35 gallons per minute, while providing an oil flow through the quenching die as high as 225 gallons per minute. The electrical equipment consists of a 7 1/2-H.P. 3600-R.P.M. pump motor and a torque motor generating 200 inch-pounds torque at a speed of 600 R.P.M. The machine weighs, without its oil supply, approximately 6000 pounds. 76

Master Model Cleereman Jig Borer

The Cleereman Machine Tool Co., Green Bay, Wis., associated with the Bryant Machinery & Engineering Co., 400 W. Madison St., Chicago 6, Ill., has announced a new Master Model 1836 jig borer, in which improvements designed to assure greater accuracy and operating convenience have been incorporated.

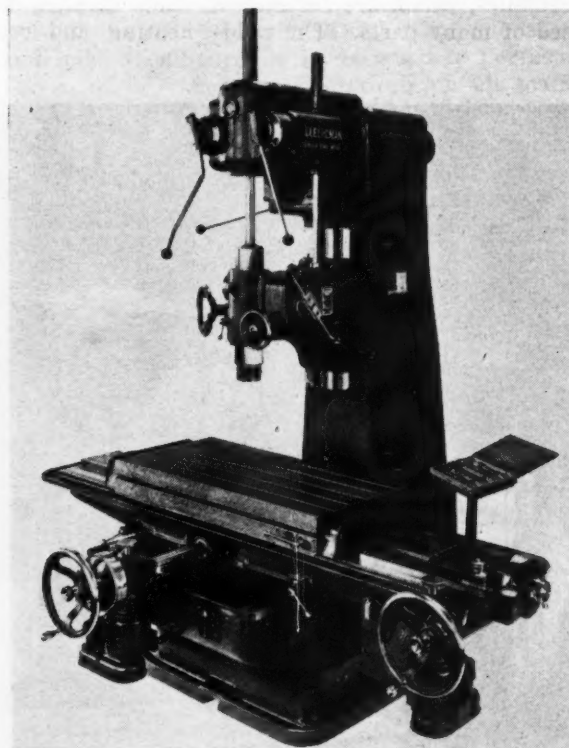
Practically every important part of this new machine has been improved. The spindle quill, for example, is now made from Nitralloy, heat-treated and nitrided to obtain an exceedingly hard, long wearing surface. This material, in combination with the Meehanite bearing

surface of the spindle head, is said to have shown no measurable amount of wear after two years of continuous use on the first experimental unit. All important castings are now made of Meehanite, and are rough-machined, normalized, and then finish-machined and scraped.

An improved clutch for connecting the large handwheel or the fine-feed handwheel to the lead-screw can be instantly engaged by a small knurled hand-knob in the center of the large handwheel. A partial turn of the knob to the right engages the fine feed, and a partial turn to the left engages the large handwheel.



Gleason Quenching Press of Improved Design for Hardening Gears without Distortion



Jig Borer of Improved Design Brought out by the Cleereman Machine Tool Co.

Rapid traverse is by means of a vertically mounted motor, which drives an Allen Bradley electrical plugging switch for braking purposes. This arrangement leaves the fine-feed handwheel free for movement by hand without releasing a mechanical brake.

The ways for the table have been lengthened 7 inches, so that the table and the wipers will not run off. The length of the center guide bearing for the saddle on the base has also been increased from 28 to 40 inches.

More ribs have been added to the interior of the base, and the length of the bearing for the column has been increased 1 1/2 inches. Two leveling screws have been added in the center of the base to prevent settling of the column and consequent misalignment. Both lead-screws have been increased to 1 15/16 inches in diameter, and are now totally enclosed. The weight of the machine is 9400 pounds. 77

Dimpling Tool

The Topflight Tool Co., Huber Bldg., York, Pa., has brought out a tool for dimpling high-stressed aluminum and magnesium metals used in aircraft construction, which

is said to eliminate the difficulties previously experienced in dimpling these materials. The dimples produced by this new spinning type tool are free from cracks, have a sharp corner at the face of the sheets, and have the appearance of a counter-

sunk surface when viewed from one side. The illustration shows the dimpler attached to a special yoke developed for operating it. Although the dimpler can be used in a drill press, it is recommended that the special yoke be employed. 78

Pneumatic Riveting Hammer

A new line of "Air-Horse" pneumatic riveting hammers featuring small size, light weight, and rugged construction has been placed on the market by the Ideal Commutator Dresser Co., 1011 Park Ave., Sycamore, Ill. Other features of this hammer include accurate balance, hand-fitting grip design, easy operation, and controllable speed. It is claimed that this hammer is so designed that the harder the work performed, the cooler the tool becomes.

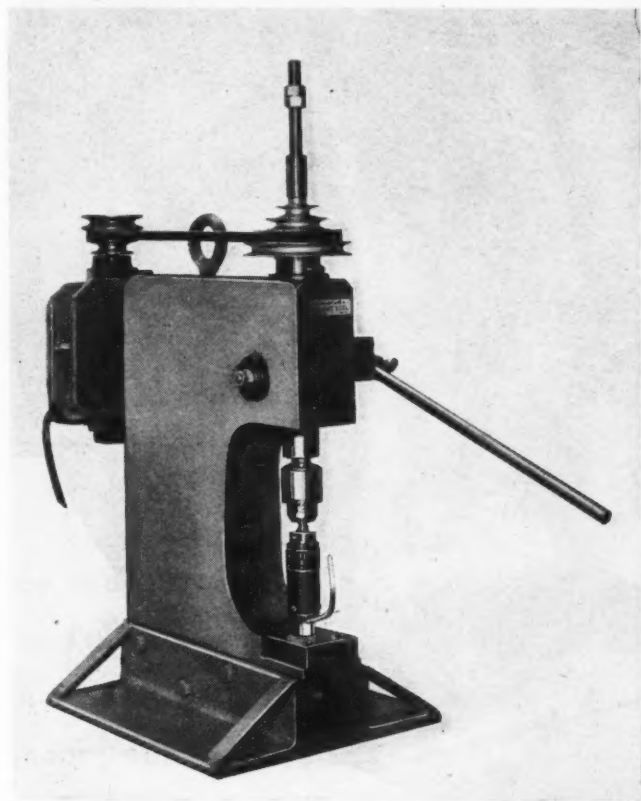
The barrel of the hammer is of one-piece, all-steel construction, the end being reinforced to take the piston impact without danger of breaking. The piston is made of hardened alloy steel, and the valve block and sleeve valve are made with large bearing surfaces to obtain longer tool life and a reduction of maintenance cost.

An air-throttling regulator valve

included with each hammer permits very fine adjustment to accommodate all kinds of riveting, even on plain or heat-treated alloy aluminum, brass, or soft iron. When provided with the proper tool, the hammer can be used effectively for calking, scaling, chipping, and similar work. It is available with offset grip handle in three sizes for light, medium, or heavy riveting. 79

Lincoln Improved Electrodes for Hard Facing

One new and one improved shielded-arc electrode, each designed for specific hard-facing applications, have been announced by the Lincoln Electric Co., Cleveland 1, Ohio. "Abraso-weld AC" is a hard-facing shielded-arc electrode intended for building up straight carbon steel, low-alloy steel, or high-manganese steel with a



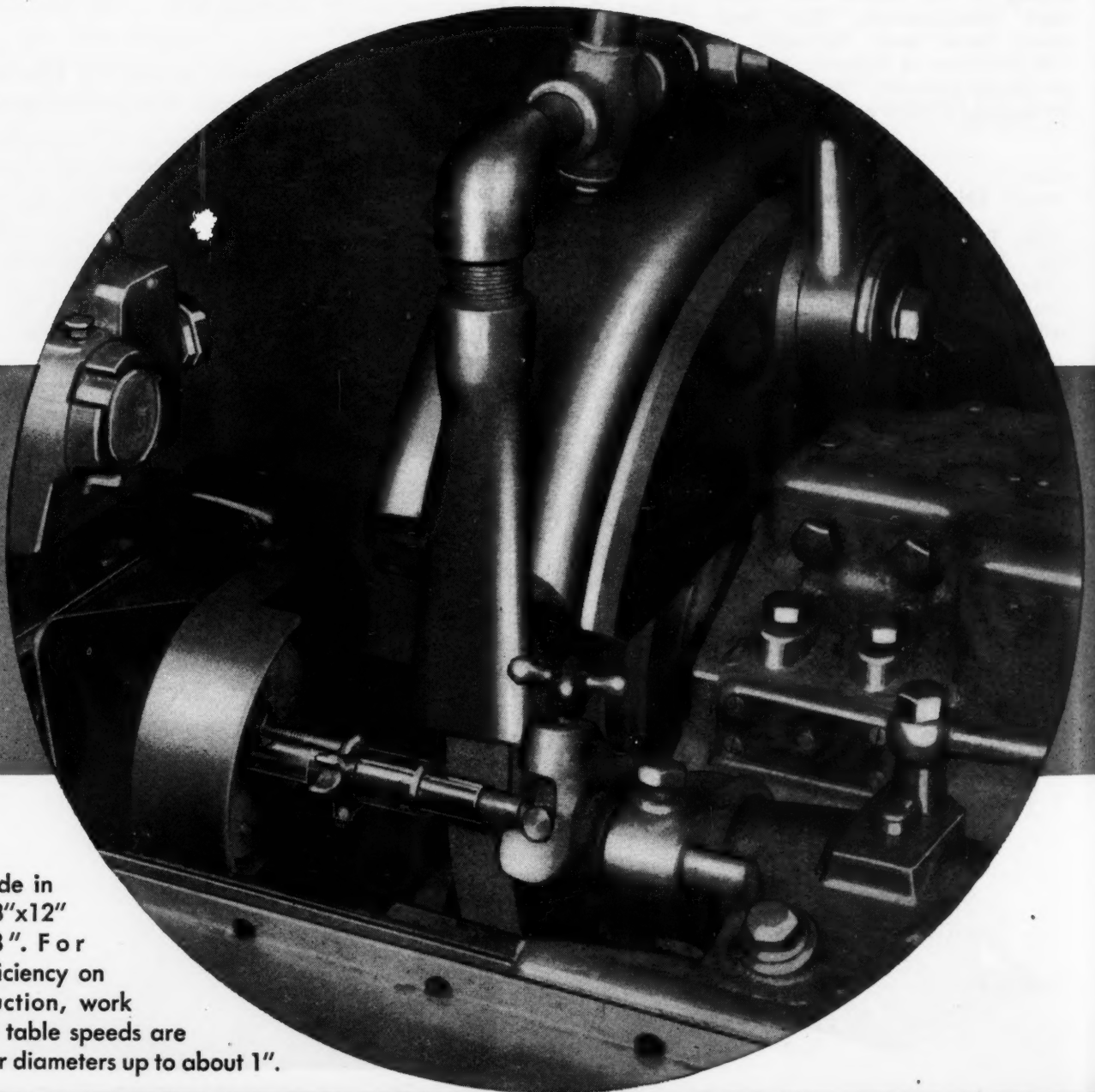
Topflight Spinning Type Sheet-metal Dimpling Tool and Yoke



Typical Application of "Air-Horse" Pneumatic Riveting Hammer

**.0002" TOLERANCE
PRACTICALLY PERFECT ROUNDNESS
NO. 2 MICRO-FINISH**

— — *this* is No 5's stated performance on grinding drum shafts — one of the most vital parts of a precision bombsight — produced in lots of 2000



No.5— made in two sizes—3"x12" or 3"x18". For greatest efficiency on high production, work speeds and table speeds are designed for diameters up to about 1".

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**SUCH ACCURACY — CONSISTENTLY REPEATED —
WITH UNUSUALLY GOOD PRODUCTION —
SPEEDS SMALL PART PRECISION GRINDING**



Ease of operation — **sturdy** precision construction
— and **many** other **profitable** features make the
No. 5 Plain Grinding Machine worthy of considera-
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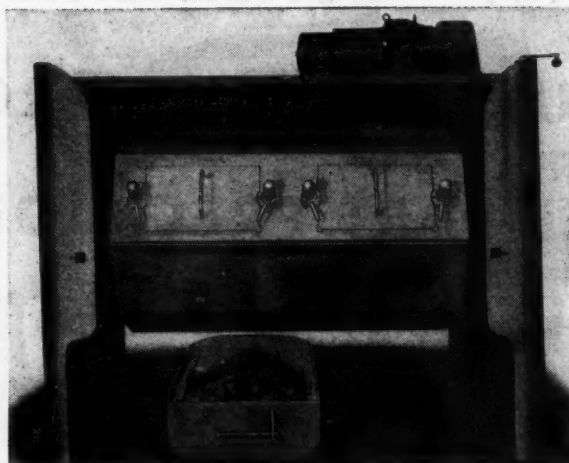


BROWN & SHARPE MFG. CO.
Providence 1, R. I., U. S. A.

BROWN & SHARPE

self-hardening deposit designed to resist severe abrasion, battering, and impact. Although made for operation on alternating current, it can also be used on direct current. Moderate peening increases the hardness of the deposited metal from 20-40 Rockwell C to over 50 Rockwell C. This electrode is available in 1/8-inch, 5/32-inch, and 3/16-inch sizes, and is furnished in 14-inch lengths.

The "Manganweld A" electrode, manufacture of which was suspended for the duration of the war, has been improved and is now made especially for use in reclaiming worn austenitic manganese-steel parts containing 11 to 14 per cent manganese. This electrode is recommended for flat work only, producing a flat bead and melting uniformly with minimum spatter. The weld deposit is air toughening, and has resistance to abrasion and impact equal to heat-treated cast-manganese steel. Weld metal, as deposited, has a hardness of 5 to 10 Rockwell C, and when cold-worked, a hardness of 45 to 50 Rockwell C. This electrode is furnished in 5/32-, 3/16-, and 1/4-inch sizes and in 14-inch lengths.80



Roto-Finish Machine Designed for the Rapid Finishing of Small Parts

Roto-Finish Machine for Mechanical Finishing of Small Parts

The Roto-Finish mechanical process developed and patented by the Sturgis Products Co., Sturgis, Mich., for finishing and deburring parts

can now be applied with increased efficiency by means of a new 60-inch wet process machine announced by this company. This machine has compartments for processing five different sizes of parts simultaneously. It has a cam lock arrangement which enables the operator to remove the door quickly and easily for rapid loading and unloading. There is also a spring valve feature which permits the escape of gases that may build up pressure within the cylinder. The lining of the octagonal cylinder can be easily removed to permit relining with fitted hard wood pieces.

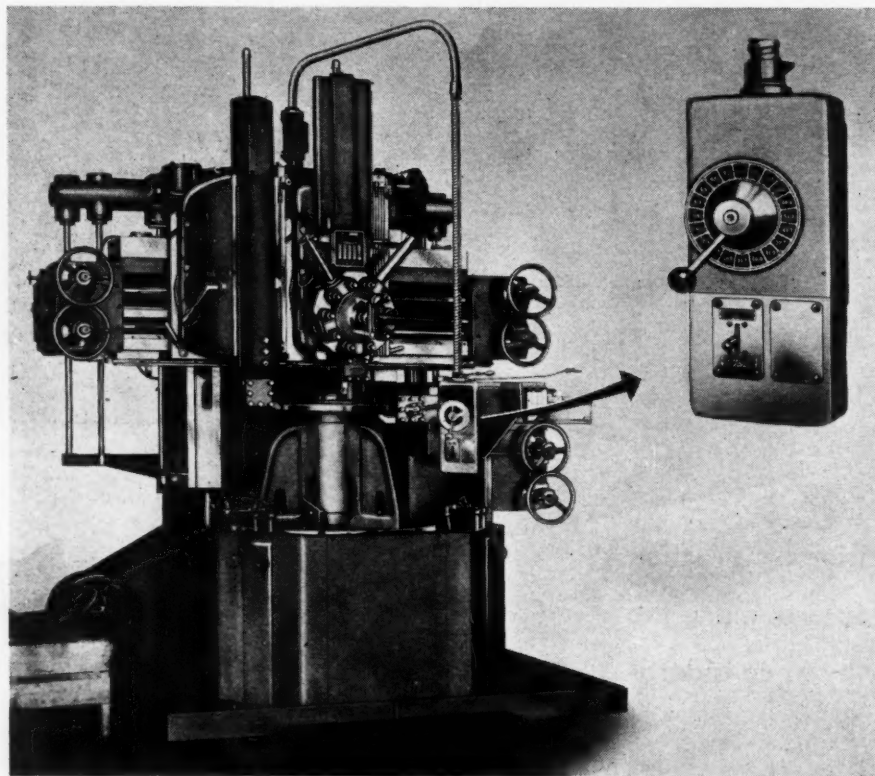
The use of predetermined combinations of chips and compounds for finishing and deburring simultaneously provides a precision grinding action that produces a bright finish of uniformly high color adapted for plating. An advantage of this process is that one operator can care for several of the machines.81

Bullard "Cut Master" Equipped with Pendant Control

A pendant control designed to provide a high degree of operating efficiency is an outstanding feature

of all "Cut Master" vertical turret lathes built by the Bullard Co., Bridgeport 2, Conn. The pendant control is carried by a swinging arm mounted on top of the machine at a height which provides full clearance for the vertical heads when raised to their highest positions. The control is located at a convenient operating height and can be swung to any desired position, either to the right or the left side of the machine.

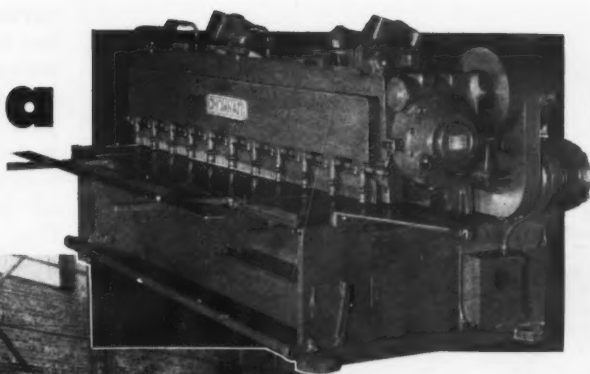
With this new control, speeds can be selected very rapidly by means of a single dialing arrangement. When the machine is in operation and a change in speed is desired, the switch lever shown in the lower left-hand corner of the pendant control box is thrown downward into the "brake" position, the change of speed quickly dialed, and the lever thrown upward into the "clutch" position. This simple operation causes the gears to be quietly and almost instantaneously shifted through electrically controlled, hydraulically operated mechanisms. The self-interlocking design protects the mechanism and insures the proper selection of gears. "Jogging" of the table for positioning and indicating purposes is easily accomplished through the use of the switch lever, which permits the positioning of the table to be readily controlled.82



Bullard "Cut Master" with New Pendant Control having Large Dial Arranged for Quick, Convenient Selection of Any Desired Speed

Use a

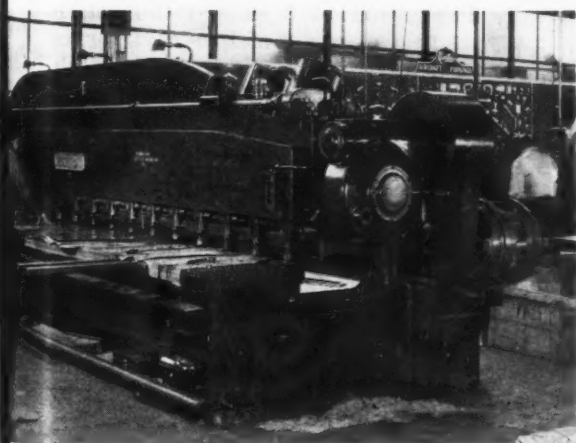
SHEAR



FOR ARMOR PLATE AND ALLOY STEELS



FOR HEAVY PLATE



FOR FERROUS, NON-FERROUS AND
NON-METALLIC MATERIAL

The clean-cut job is the profitable job. Shearing square, shearing straight, shearing to close tolerances—lowers cost of forming and smoothes the assembly.

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LeMaire Seven-station Automatic for Machining Wheel Cylinders

LeMaire Special Wheel-Cylinder Drilling, Reaming, Boring, and Tapping Machine

A special-purpose machine has been designed and built by the LeMaire Tool & Mfg. Co., 2657 S. Telegraph Road, Dearborn, Mich., for drilling, reaming, boring, counter-boring, chamfering, and tapping wheel cylinders in one setting at the rate of approximately 840 pieces an hour. It is claimed that this arrangement results in very accurate, uniformly finished work.

Four parts are held at one time in each fixture by air-operated clamps, and are released by means of a cam rail. Brackets mounted on each end of the fixtures contain two bushings which accommodate pins in bushing plates on the drill units

and the head of the tapping unit to assure positive alignment.

The machine itself is composed of five LeMaire No. 2000 self-contained hydraulic drilling units and one LeMaire No. 150 lead-screw tapping unit. These units are mounted at various angles on a fabricated base which supports a seven-station, 54-inch automatic indexing table. 83

Marion Induction Heater for Production Soldering

A portable bench type induction heater designed for use wherever small parts or assemblies need sol-

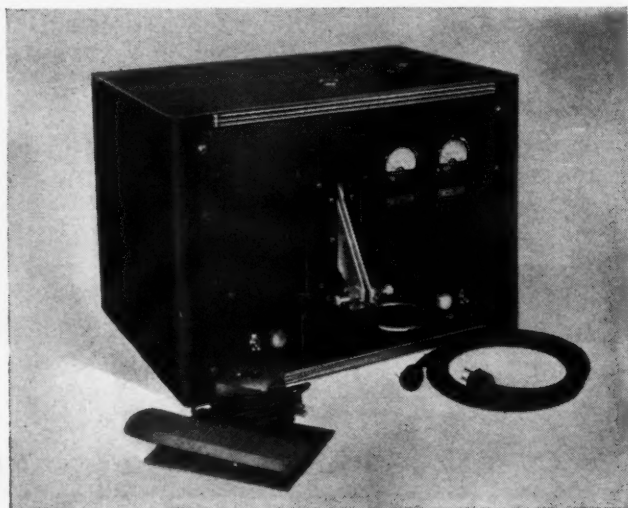
dering has been placed on the market by the Marion Electrical Instrument Co., Manchester, N. H. It is adapted for clean soldering of small parts and for soldering metal to metallized glass and ceramics.

Originally developed at the plant of the Marion Electrical Instrument Co., this new unit has undergone many refinements, with the cooperation of the Polytechnic Research and Development Co., Inc., Brooklyn, N. Y. The bench type induction heater is furnished in a standard relay rack cabinet. It measures 15 3/4 by 21 1/2 by 15 inches, and weighs 150 pounds. A 115-volt, 60-cycle power supply is required, but since the input is only 775 watts no special wiring is necessary. 84

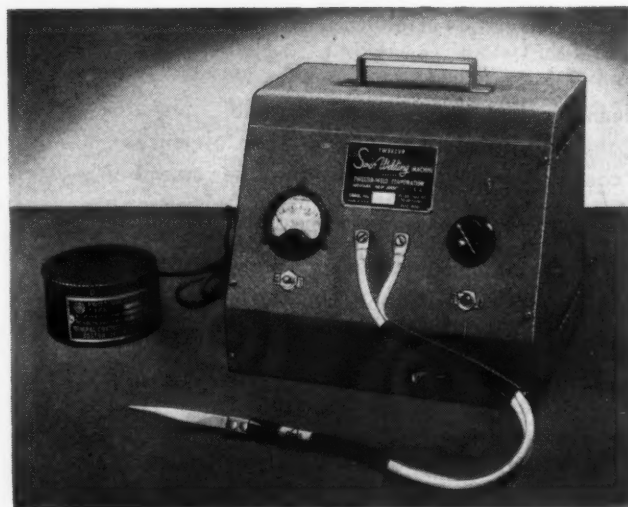
Besco Tweezer Spot-Welding Machine

A portable Besco tweezer spot-welding machine weighing approximately 25 pounds is being manufactured by the Tweezer-Weld Corporation, 280 Plane St., Newark 2, N. J. To the cabinet of this welder, which is the size of a small radio set, is connected a pair of insulated forged copper tweezers and a foot-switch. Power is supplied by connection to a 115-volt, 60-cycle line, but the set can be easily adapted for operation on 220-volt circuits. It has wide applications in industries fabricating metal parts from 0.0005 to 1/8 inch in thickness or diameter.

To weld round parts from 0.015 up to 1/8 inch in diameter, the machine is used with an auxiliary booster unit, which increases the normal capacity of the equipment by



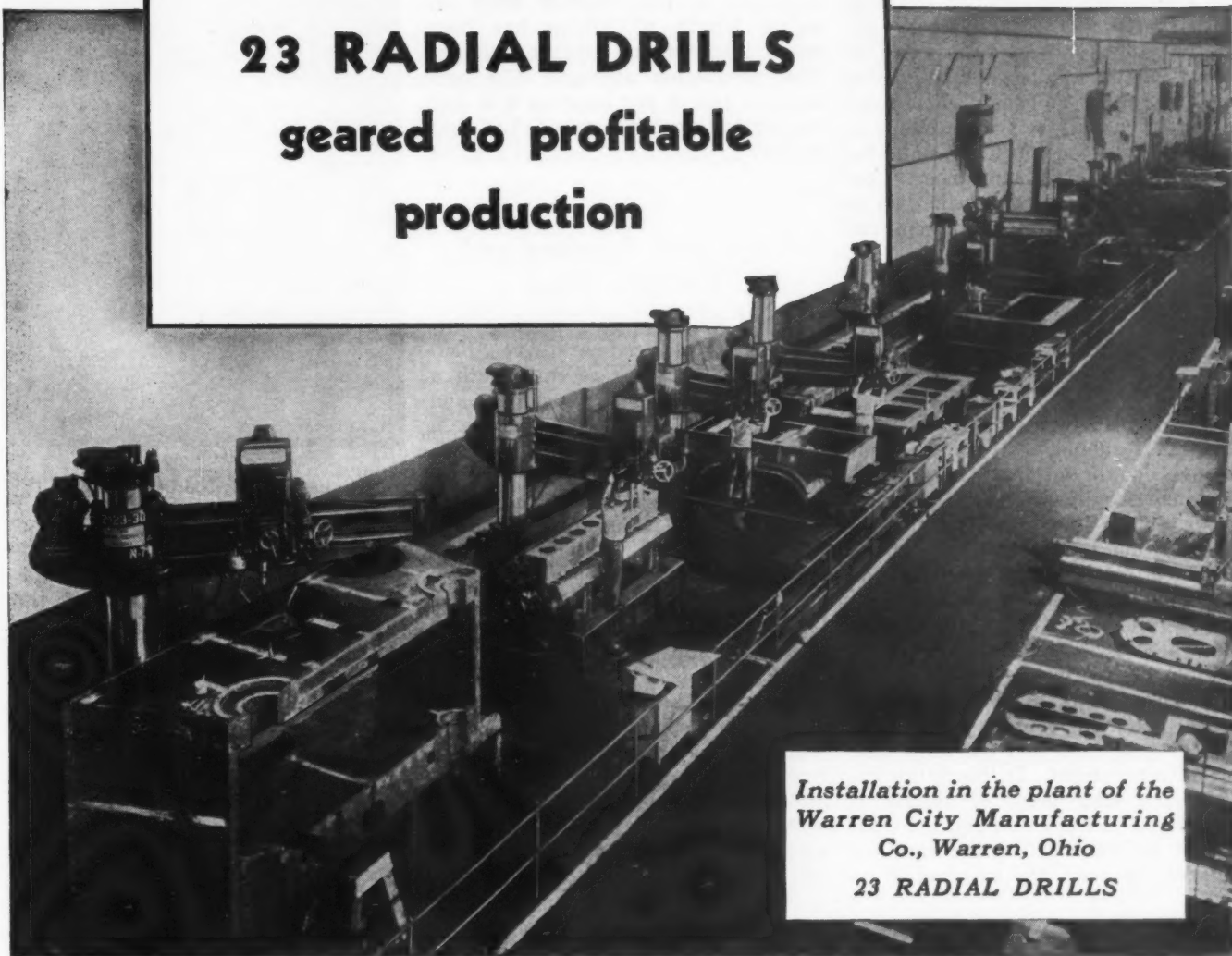
Marion Bench Type Portable Induction Heater for Production Soldering



Besco Spot-welding Machine for Light Work Made by Tweezer-Weld Corporation



23 RADIAL DRILLS geared to profitable production



*Installation in the plant of the
Warren City Manufacturing
Co., Warren, Ohio
23 RADIAL DRILLS*

● This is one of the largest radial installations in the country. Note the many types of jobs being worked on at one time.

The Cincinnati Bickford SUPER SERVICE Radial Drill is adapted to a wide variety of heavy drilling, and its versatility is such that new applications are being continually found for it.

Here, by a special cribbing arrangement, materials of large dimensions are being handled.

Each radial is equipped with a travel base, and an automatic cooling system.

The controls are always accessible, increasing production by reducing time and physical effort.

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See our condensed catalog in Sweet's File.

*Equal Efficiency of Every Unit
Makes the Balanced Machine*

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9, Ohio U.S.A.,
MACHINERY, March, 1946—205

300 per cent. Through the use of the tweezers, the electrodes can be applied directly to the elements to be joined. The tweezers can be held in the hands with absolute safety, and they will not heat up even under continuous use.

In making a weld, the voltmeter is set and the two pieces of metal to be joined are held under pressure with the tweezer tips, while the operator steps on the foot-switch to effect the weld. In welding heavier gage metal where considerable pressure is required, the tweezers may be removed and the machine connected to a drill press or hand arbor. Copper or copper-alloy rods can then be used as electrodes, the bottom rod being insulated.85

Automatic Cut-Off Attachment for Pines Benders

The Pines Engineering Co., Inc., 220 S. Highland, Aurora, Ill., has announced an automatic cut-off attachment for all six sizes of its automatic tube- and pipe-bending machines which handle tubing from 3/4 inch to 5 inches outside diameter and pipe up to 4 inches outside diameter.

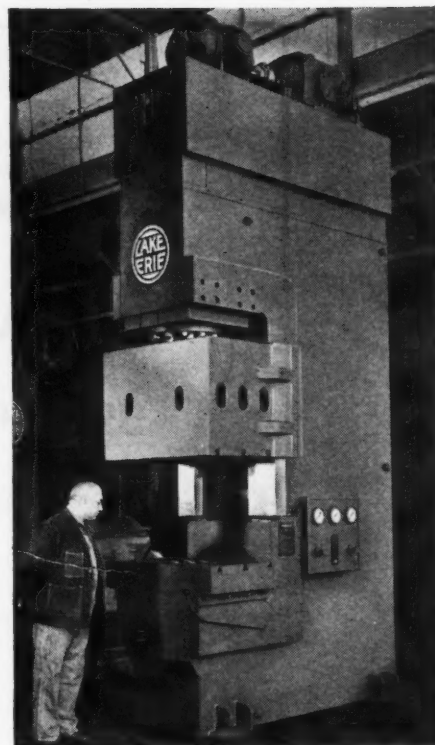
The No. 3/4 hydraulic bender illustrated is equipped for full-automatic manufacture of return bends or elbows. This machine uses the Pines patented booster attachment for the tube feed and the automatic cut-off attachment. In operating the bender, a long piece of tubing is placed over the mandrel and the start button pressed. After the machine finishes the bend, the mandrel is ex-

tracted, and before the clamps are opened, the saw is passed through the tube by means of a hydraulic feed. The bending arm then returns, the mandrel advances, and the tube is fed out automatically the amount required for another piece, after which the operation is repeated. The machine continues to operate automatically in this manner until the entire length of tubing has been made into return bends or elbows. The production averages 650 bent and cut pieces per hour on 3/4 inch copper tubing bent on a 1 1/4 inch center.86

Lake Erie Bending and Forming Press

The Lake Erie Engineering Corporation, 170 Woodward Ave., Buffalo 17, N. Y., has recently built a hydraulic press for bending and forming steel parts, which has a number of rather unusual features. The press is a 200-ton "C" frame type with a die space 42 inches right to left and 24 inches front to back. It has a 30-inch daylight opening, and a stroke of 16 inches. The outstanding features of this press are its high speed, great strength, compact size, and the cushion incorporated in the bed.

The press has a closing speed of 350 inches per minute. It has a welded steel housing, with extra heavy "C" type frame construction designed for minimum deflection under load. The upper or moving platen is rigidly guided. The cushion in the bed has a capacity of 35 tons.

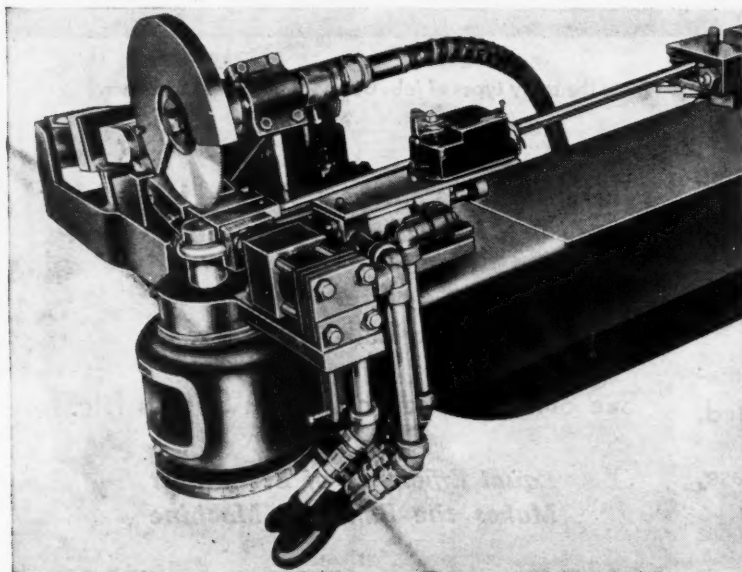


Lake Erie Hydraulic Bending and Forming Press

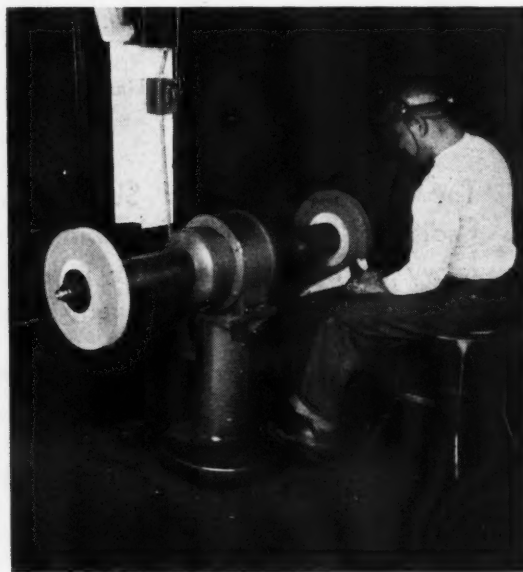
The press is operated by a hand-lever, and sensitive control of the operating speed is obtained by direct control of the hydraulic pump.87

Hobart Buffing and Grinding Machine

A low pedestal type buffer and grinder designed especially for use in blacksmith shops for the grinding and buffing of plowshares and other



Pines Tube-bending Machine Equipped with Automatic Cut-off Attachment



Hobart Pedestal Type Buffing and Grinding Machine

long odd-shaped pieces, but which is also adapted for a wide variety of buffing and grinding jobs in machine-building shops, has been placed on the market by the Hobart Brothers Co., Motor Generator Division, Hobart Square, Troy, Ohio. Over 40 inches of working space is provided between the wheels of this grinder. The low design of the pedestal enables the worker to sit in a comfortable position, press the work-piece between his protected knee and the buffing wheel, and easily apply sufficient pressure to produce a very smooth finish.

These grinders are fabricated from steel sheets which are rolled and electrically welded to insure light weight but sturdy construction. The ball bearings and the non-stalling motor are fully enclosed, and the accurately balanced shaft and motor rotate on three heavy-duty ball-bearings with a minimum of vibration.

The motors are of the repulsion-induction single-phase, or the squirrel-cage induction three-phase type rated at 3 H.P., 1750 R.P.M., and will not slow down under the rated load. The starting switch is located on the pedestal within easy reach of the operator's hand or knee.89

Davis & Murphy Spot-Welder

A USP-7 1/2 K.V.A., air-operated, plug-in, bench type spot-welder has just been added to the universal line of 1- and 3-K.V.A., air-operated, Midget bench type spot-welders placed on the market by Davis & Murphy, Davis Bldg., 5252 Broad-

way, Chicago 40, Ill. This welder can be furnished with a built-in NEMA 1A electronic timer or with any NEMA 3B or 5B timer in a separate panel.

Solenoid valve control of the air cylinder by an adjustable pressure switch provides a wide range of uses for welding non-ferrous metals, wire, and jewelry. Sufficient capacity is available for welding two pieces of 16-gage steel. The welder is equipped with air filter, pressure gage, and automatic lubricator. Initiation of the welding cycle is by electric foot switch. The transformer and electrodes are water-cooled.89

Lincoln Portable Welder

A new 200-ampere welder of the gasoline-engine driven type, especially designed to meet the requirements for a complete inexpensive, light-weight unit, has been announced by the Lincoln Electric Co., Cleveland 1, Ohio. This welder, known as the "Shield-Arc Junior," is 24 by 48 by 30 inches in size, and weighs 660 pounds. It has a current range of from 40 to 250 amperes, and can be used for welding light- or heavy-gage metal, repairing cast-iron structures such as engine blocks, fabricating tools and machinery parts, and hard-facing worn parts.

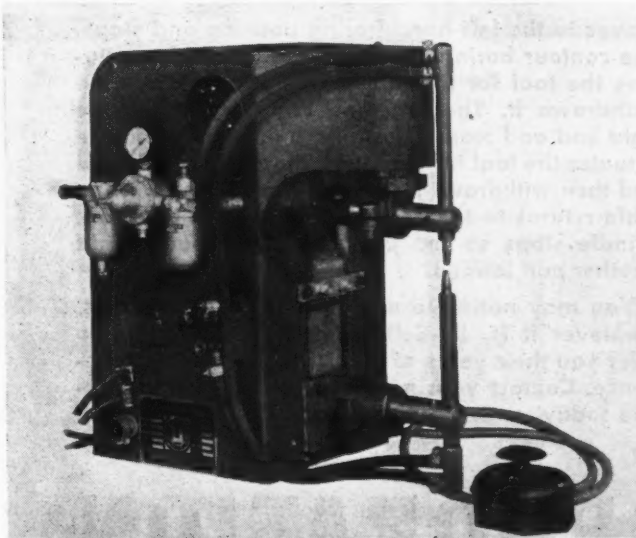
The complete unit is protected from falling objects by a canopy or shroud which also affords protection from the weather. Two transverse mounting rails, designed for bolting to the floor or platform, permit the welder to be mounted on a shop or road type trailer.90



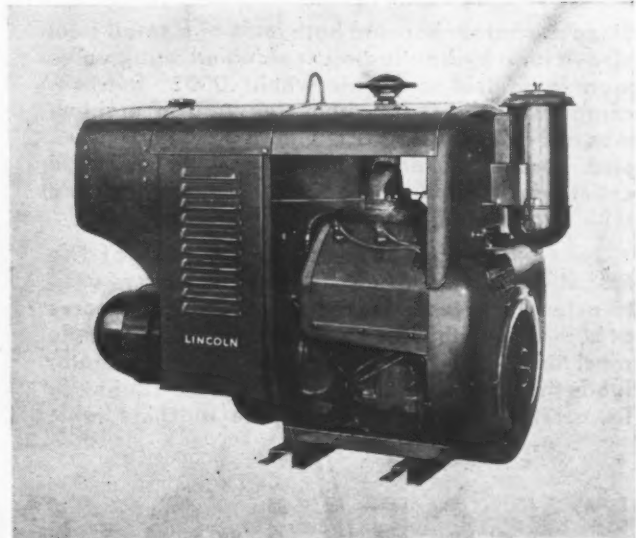
P & W Ball Gaging Comparator

P & W Electrolimit Ball Gaging Comparator

Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., has announced the development of a Model CE-699 Electrolimit external comparator for use in checking balls. This comparator is equipped with a special gaging spindle, anvil, and back-stop, designed to facilitate the accurate inspection of



Universal Air-operated Spot-welder Brought out by
Davis & Murphy



Portable "Shield-Arc Junior" Welder with Gasoline-
engine Drive



Gives You the Economy and Versatility of a Standard Machine With the Efficiency and Low Unit Cost of a Special

Stepped contour bores at both ends of a small steel sleeve for a hydraulic direction and metering valve were to be held concentric within .0002" and concentric with the O.D. within .0005". The problem was solved by using a standard Ex-Cell-O Precision Boring Machine with a specially designed collet which holds the part without distortion, and with two special contour boring devices.

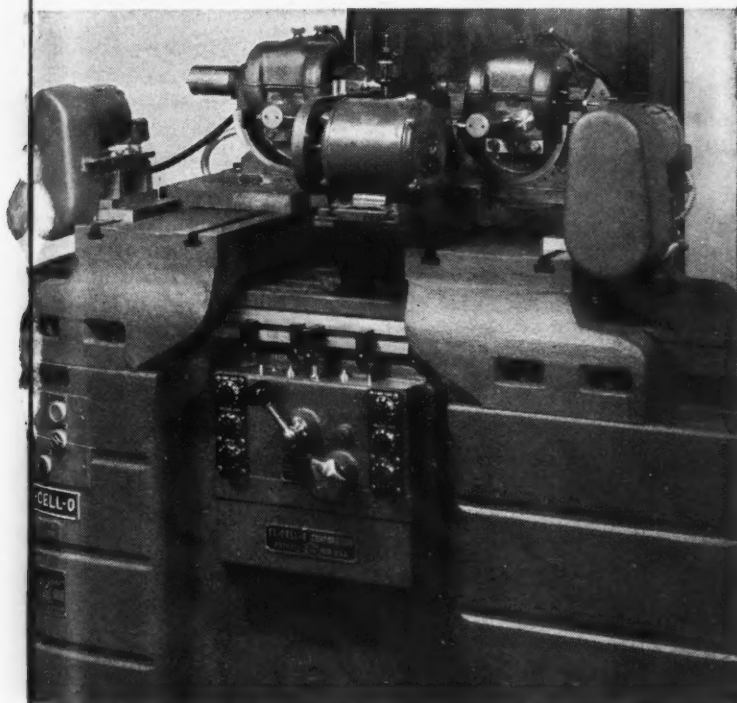
These boring devices, adaptations of the Ex-Cell-O Universal Cam Type Dresser, were used to actuate the tools for the stepped contour bores at both ends within the prescribed limits. The simple machine cycle makes operation easy. The operator loads the part in the collet and shifts the start cycle lever. The collet drive starts; the machine table

moves to the left hand boring position and stops. The contour boring device on the left bridge actuates the tool for the left hand boring cycle, then withdraws it. The machine table moves to the right end and stops. The right hand boring device actuates the tool for contour boring at the right end and then withdraws it from the work. The machine table returns to the central position and the work spindle stops so the part can be unloaded and another part loaded.

You may not have a problem exactly like this. Whatever it is, Ex-Cell-O engineers are glad to offer you their years of precision machining experience. Contact your nearest Ex-Cell-O representative today, or write direct to Ex-Cell-O at Detroit.

EX-CELL-O CORPORATION

Now YOU CAN DO STEPPED CONTOUR BORING ON A STANDARD EX-CELL-O BORING MACHINE



Above: The machine operation is extremely simple because the problems involved were solved by proper tooling. This standard Ex-Cell-O Style 1212-A Precision Boring Machine with special tooling was used for this unusual application.

Where increased production, high accuracy, and greater economy through multiple operations are required . . .
See EX-CELL-O First!

DETROIT 6



Standard and Special
Multiple Way-Type
Precision Boring
Machines

Continental Cutting
Tools

Precision Thread
Grinding Machines

Precision Lapping
Machines

Broaches and Broach
Sharpening Machines

Multiple Drilling and
Other Special
Purpose Machines

Tool Grinders

Hydraulic Power
Units

Grinding Spindles

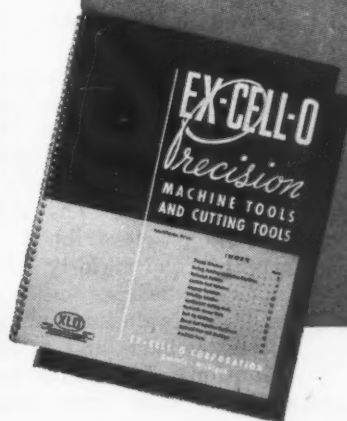
Drill Jig Bushings

Aircraft and
Miscellaneous
Production Parts

Fuel Injection
Equipment

R. R. Pins and
Bushings

Pure-Pak Paper Milk
Bottle Machines



GET YOUR FREE COPY of this useful book. Illustrates and describes Ex-Cell-O's complete line of Precision Machine Tools, Cutting Tools, and facilities for parts production. Write for Ex-Cell-O Bulletin 27121.

balls. The gaging spindle and anvil are identical pieces having a tungsten-carbide gaging tip formed to a radius of 0.020 inch.

The back-stop is a tungsten-carbide vee, located in the anvil fixture, with provision for both vertical and horizontal adjustments. The indicating meter can be graduated to 0.0001, 0.00005, or 0.000001 inch to meet any inspection requirement. The complete equipment, including some accessories not shown in the illustration, adapt this comparator for inspecting balls of from 1/16 to 11/16 inch in diameter. _____91

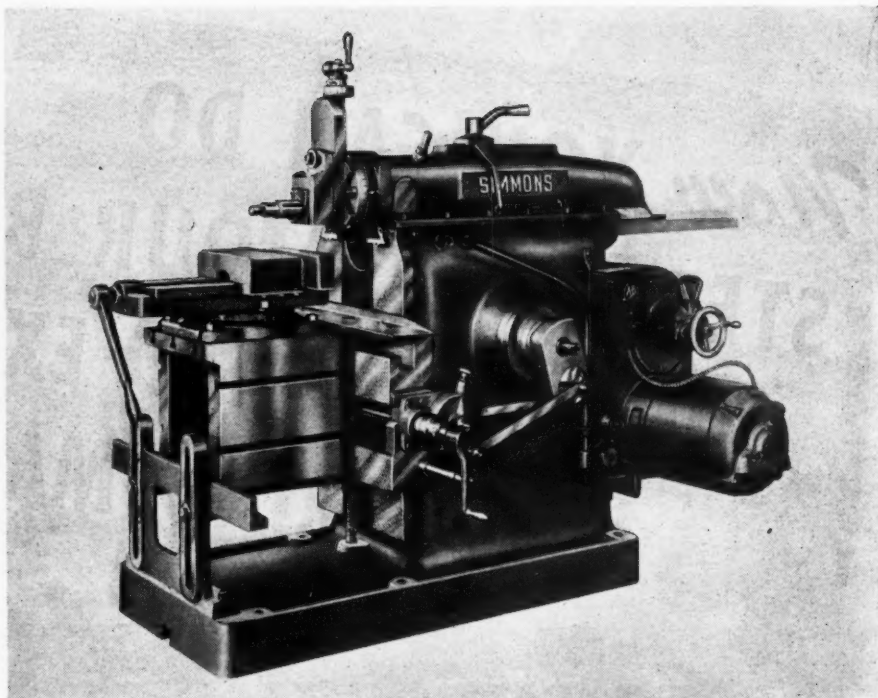
Drillet Box Jigs

The Chicago Drillet Corporation, 928 S. Michigan Ave., Chicago 5, Ill., has brought out a line of Drillet box jigs designed to reduce to a minimum the cost and time required to construct jig bodies for drill press operations, such as drilling, reaming, counterboring, countersinking, spot-facing, tapping, etc. The box jigs are available in 150 sizes and in square and rectangular shapes to accommodate work of all kinds and sizes up to a maximum of 6 inches.

The sides of the jigs, which are removable, as shown in the lower view of the illustration, and the thumb-screw and leaf arrangements are so designed that it is possible to use all six sides of the jig for the mounting of drill bushings. The jig can be opened to receive work by simply turning the thumb-screw and raising the leaf. After the work or part has been placed in the jig and properly clamped, the leaf is brought



Drillet Box Jig Available
in 150 Sizes



Simmons Shaper Equipped with Micro-Speed Drive

into position and locked by the thumb-screw, ready for the drilling or reaming operation.

The corner posts of the jigs are of hardened steel, and all sections are surface-ground. The feet and leaf pivot pins are also hardened and ground. The side plates and end leaves are interchangeable and replaceable. The sides are held square and parallel within 0.0005 inch.92

Simmons Shaper with Variable-Speed Drive

A new 20-inch shaper with a hand-wheel-controlled variable-speed drive which gives an unlimited range of speeds to the ram has been announced by the Simmons Machine Tool Corporation, 1600 N. Broadway, Albany 1, N. Y. This "Micro-Speed" shaper has been designed to meet the demands of heavy production work, as well as the exacting requirements of the tool-room.

The extreme length of the ram stroke is 20 3/4 inches, the horizontal travel 23 inches, vertical travel 16 1/2 inches, and the maximum distance from the table to the ram 16 1/2 inches. The column is extremely well ribbed to obtain strength and rigidity. It carries the bull-gear bearing on a convex side wall to obtain maximum resistance to thrust loads and equal stress distribution. The clutch is of the dry multiple disk type requiring only

simple adjustment. A feed range of 0.006 to 0.080 inch is available. All gears in the driving train are of the helical type, selected for smooth and quiet operation. The heavy-duty vise with hardened steel jaws, supplied as standard equipment, can be swiveled through an angle of 360 degrees. 93

Barnaby "Jam-Proof" Tap-Holder

A new draw-out style, non-releasing tap-holder of rugged construction has been brought out by the Barnaby



"Jam-Proof" Draw-out Style
of Tap-holder

Mfg.
Brid
built
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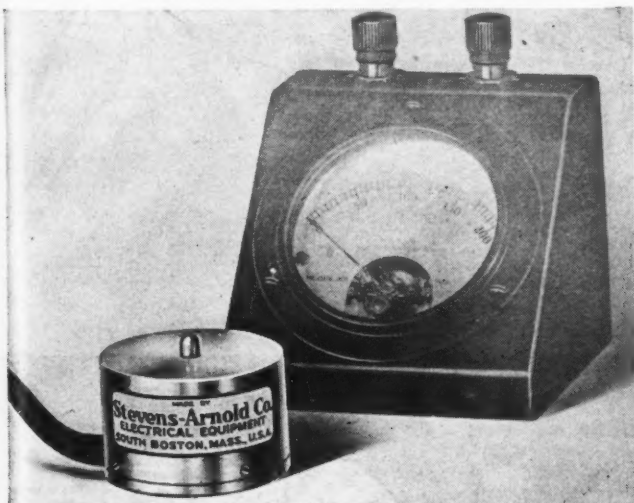
To
des

Mfg. & Tool Co., 70 Knowlton St., Bridgeport 8, Conn. This holder is built to withstand severe tapping operations without sticking or jamming. A small amount of "float" is incorporated in the holder to compensate for or correct any slight misalignment in the machine. Two free-sliding cylindrical guide keys are incorporated in the holder to assure smooth, dependable operation. These tap-holders are available in three sizes with shank diameters of 5/8, 3/4, and 1 inch. 94

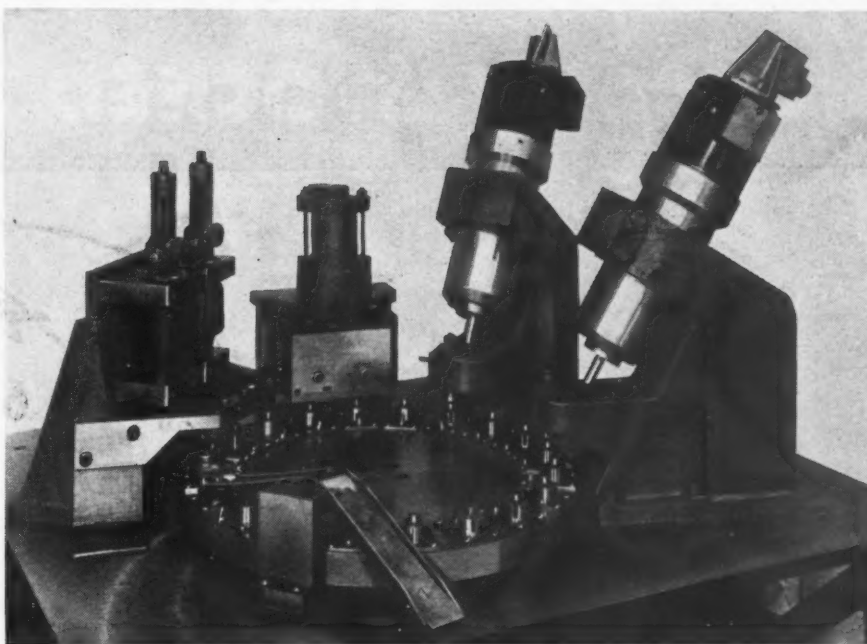
Precision Pressure and Deflection Pick-Up Unit

A deflection pick-up comprising a hermetically sealed electrical unit which translates minute deflections or pressure variations applied to its plunger into linear changes in its direct-current output voltage has been placed on the market by the Stevens-Arnold Co., 22 Elkins St., South Boston, Mass. This pick-up makes possible accurate readings in the range of 0.0005 to 0.1 inch movement of the plunger with reliable operation at frequencies up to 100 cycles per second.

The combination of this pick-up and an inexpensive indicating voltmeter constitutes an electric micrometer having a range of 0.001 to 0.1 inch; means for making electrical measurements of force, acceleration, and pressure; and an efficient electric deflection gage. The pick-up is hermetically sealed, and can be operated while submerged in water. The power supply can be obtained from a 115-volt alternating-current line or an 8-, 12-, or 24-volt battery. The readings can be recorded on a continuous strip chart. 95



Stevens-Arnold Pressure and Deflection Pick-up Unit



Automatic Drilling, Etching, and Cleaning Machine Developed by Simplex Tool Engineering Co.

Automatic Drilling, Etching, and Cleaning Machine

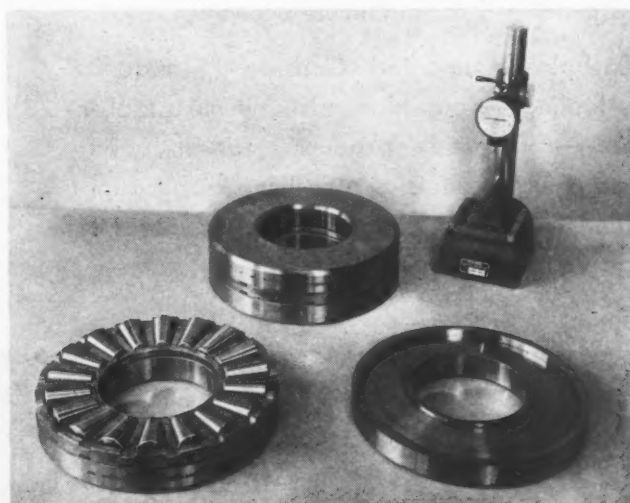
The Simplex Tool Engineering Co., 2540 Park Ave., Detroit 1, Mich., has recently developed the high-production set-up illustrated for drilling, etching, and cleaning a small cast-iron automotive part. The parts are loaded on an automatic rotary index-table and drilled in the first position shown at the extreme right, using two Simplex automatic drilling units. In the second position, the parts are etched or engraved by a special air-operated broaching fixture; and in the final position, they are cleaned by brushes operated by air motors.

After being cleaned, the parts are

automatically ejected by means of the ramp shown at the extreme left. The machine has a production capacity of 3000 pieces per hour. The Simplex automatic drilling units shown are made in sizes for drills ranging from No. 54 up to 1/4 inch in diameter. 96

Kaydon Conical Roller Thrust Bearings

The Kaydon Engineering Corporation, Muskegon, Mich., has placed on the market a conical roller thrust bearing designed to supplement the straight roller type thrust bearings. Conical bearings of this type are being used extensively in oil-field



Kaydon Conical Roller Thrust Bearings

Specify **THESE LOW COST-
LOCALLY STOCKED STANDARDS** for

Adaptable
**TO 60%-80% OF YOUR
CARBIDE NEEDS**



- Stocked in 45 cities coast-to-coast . . .
- Suitable for 60%-80% of ALL your carbide needs . . .
- You can quickly grind to special shapes . . .
- Mass produced for maximum economy . . .

. . . Carboly Cemented Carbide "Standards" simplify tooling—permit low cost, minimum tool inventories—save time—produce highest quality results on a wide range of machining applications. For cutting all metals and non-metallics. Send for 32-page Catalog GT-175R.

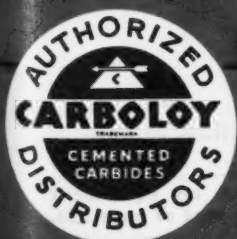
CARBOLLOY COMPANY, INC.

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s for use throughout Your Plant



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DISTRIBUTORS IN 45 CITIES COAST TO COAST**

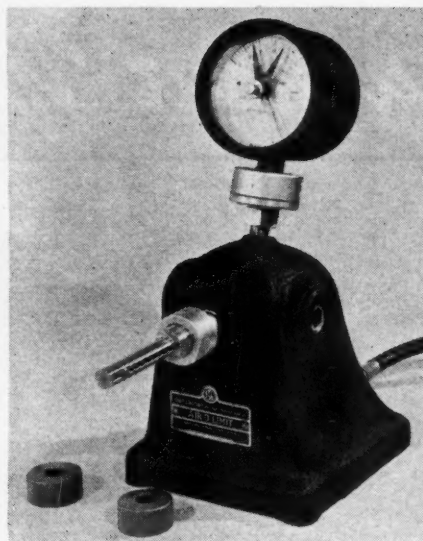
swivels, where the bearing must carry the entire weight of the drill pipe in wells 15,000 feet or more in depth. The same type of bearing is also used in many applications in steel-mill equipment and paper-mill machinery, as well as for other heavy-duty work.

The apexes of the roller cones of this bearing meet at the true center of the bearing. This design makes the rollers self-aligning between the tapered faces and the outside rib of the raceways. The one-piece Kaydon bronze cage acts only as a roller separator. As the conical roller thrust bearings are designed to carry thrust loads only, the mountings should be designed to avoid radial load interference. A complete series of standard sizes of conical roller thrust bearings ranging from 9 7/8 up to 19 1/2 inches outside diameter, with load capacities up to 440,000 pounds, are being made by this company. _____ 97

Improved Air-O-Limit Comparators

Higher magnification for the P & W Model B2 Air-O-Limit comparator manufactured by Pratt & Whitney Division Niles-Bement-Pond Co., West Hartford 1, Conn., can now be obtained by means of an adjustable compensator, which can be readily attached to the comparator. This attachment allows full-scale graduations of 0.0004, 0.0006, 0.0008, and 0.001 inch to replace those of 0.002, 0.003, and 0.004 inch normally used.

In addition to higher magnification, the adjustable compensator offers the advantages of greater di-



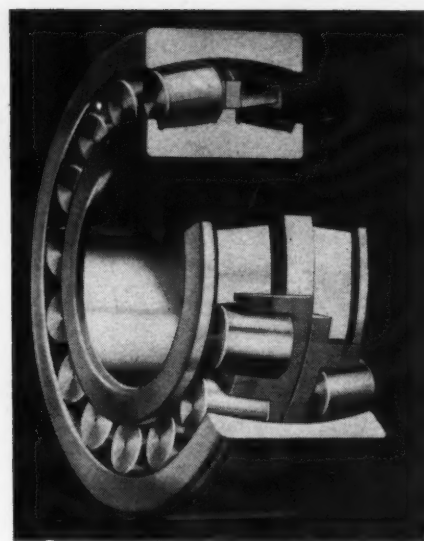
P & W Air-O-Limit Comparator with Adjustable Compensator

ametral clearance, better side compensation, longer wearing qualities, and greater speed at the higher magnification. A special series of gaging plugs is required for the adjustable compensator.

To enable hand-gaging to be accomplished at some distance from the comparator, a Model R2 Air-O-Limit comparator with booster relay has been brought out. The booster relay permits the use of any length hose between the gage cabinet and the gage plug without loss of gaging speed or accuracy. _____ 98

Bantam Self-Aligning Spherical Roller Bearing

The Bantam Bearings Division of the Torrington Co., South Bend 21, Ind., has added a self-aligning spher-



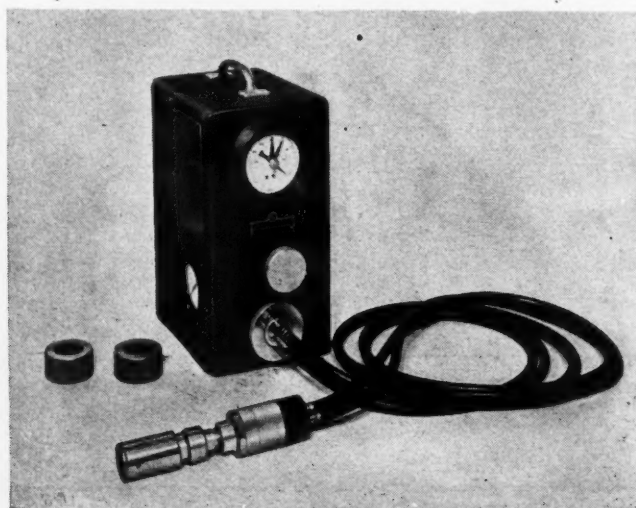
Bantam Heavy-duty Self-aligning Spherical Roller Bearing

ical roller bearing to its line of anti-friction bearings. This new bearing is adapted for heavy-duty operation in a wide range of equipment, including steel mill and mining machinery.

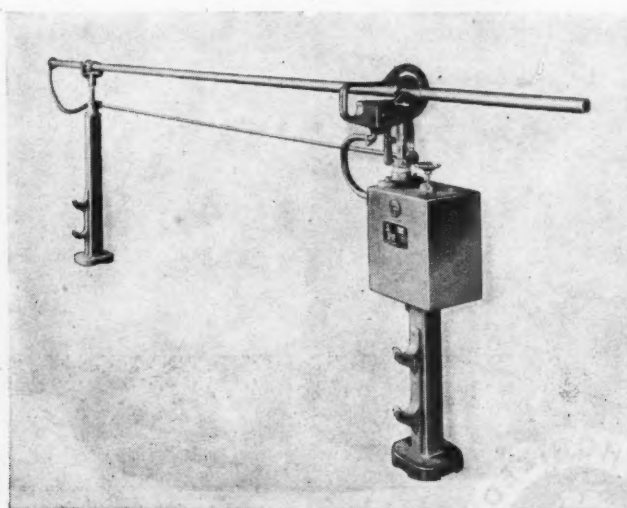
In addition to the self-aligning feature, this bearing is designed for two-directional thrust and high radial and high thrust capacities, and is of unit type construction developed for easy installation. It will be made in a full range of sizes from 1.5748 inches up. _____ 99

Lipe Pneumatic Bar Stock Feed

The pneumatic bar feed manufactured by the Lipe-Rollway Corporation, Syracuse 5, N. Y., is now being made in additional sizes and new



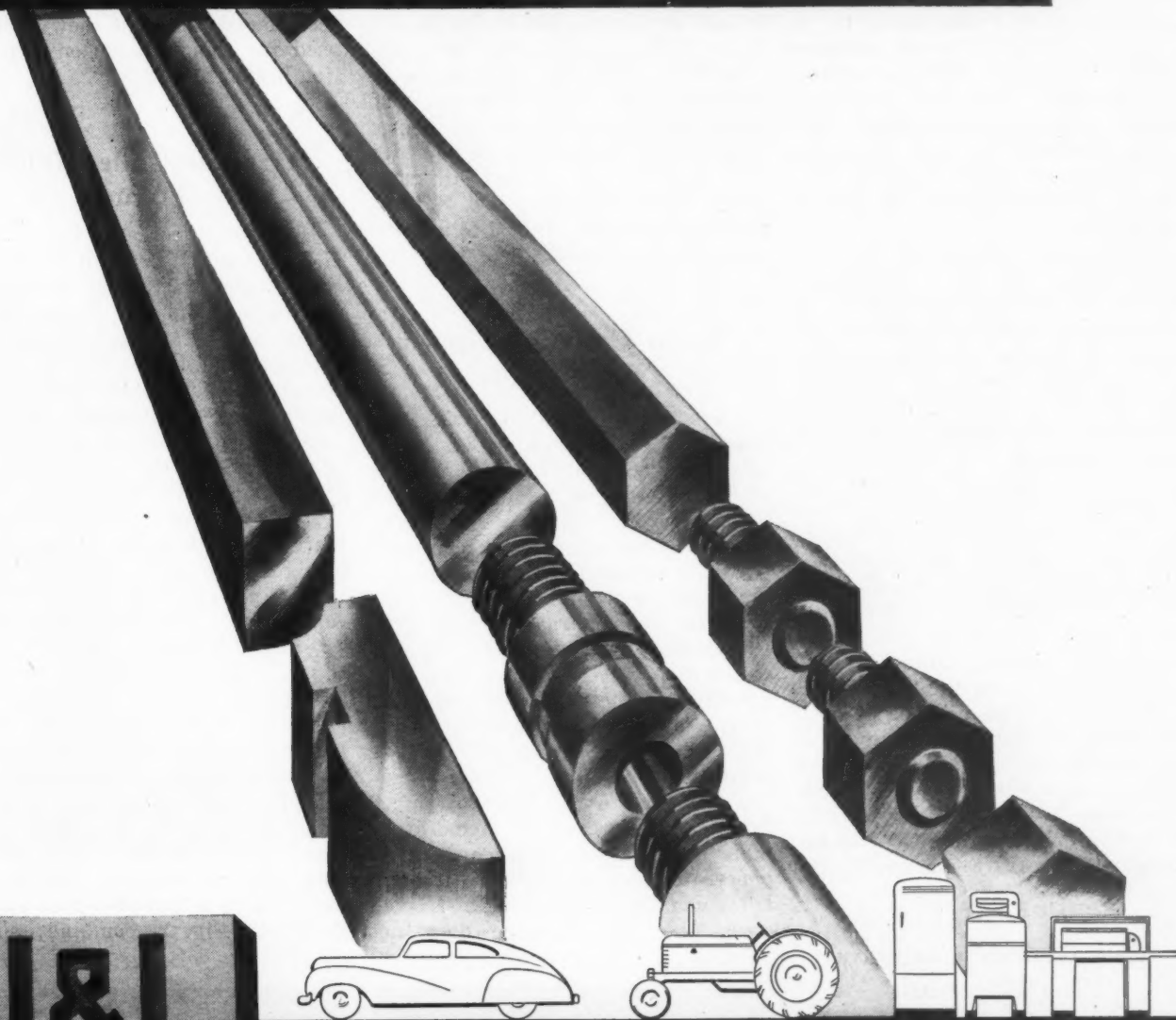
P & W Air-O-Limit Comparator with Booster Relay



Pneumatic Bar Stock Feed Made by Lipe-Rollway Corp.

J&L COLD FINISHED STEEL

FOR EASILY MACHINED • ACCURATE PARTS



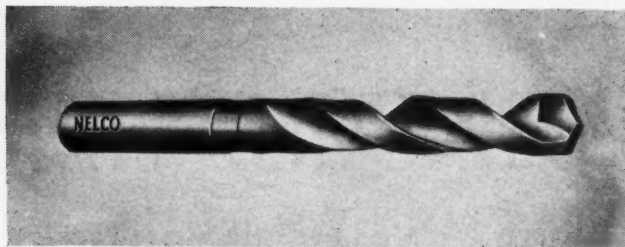
**J&L
STEEL**

In addition to improved machinability and longer tool life obtained through use of J&L Cold Finished steel, many manufacturers specify this precision product for its improved surface finish. They also obtain in J&L cold drawn and cold rolled bars and special shapes the higher physical qualities needed for parts of modern high-speed machines. J&L engineers and metallurgists will be glad to assist you with your production problems. Write or phone your nearest J&L office.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH, PA.



Van Keuren Carboly Wire Type Precision Plug Gage



Carboly-tipped Twist Drill Made by the Nelco Tool Co., Inc.

assembly designs developed to increase the output of screw machines and turret lathes. This pneumatically operated feed for Brown & Sharpe automatics and small hand screw machines is now furnished with improved pedestals which offer several advantages over the preceding models.

The control cabinet of the new feeds has been moved to the forward end of the feed cylinder where the operator can make the necessary adjustments without leaving his normal working position. The new pedestals have a smaller base, which facilitates installation where floor space is limited.

Two new sizes are available for small hand screw machines—a Model 68, which takes stock 1/2 inch in diameter by 12 feet in length, and a Model 100, which will handle stock 3/4 inch in diameter by 12 feet long; also a larger size, Model 500, with a capacity for feeding tubing or light metal bars in sizes up to 4 inches in diameter. The new pedestal is also being furnished with nine regular models of the Lipe bar stock feeds which cover a range of capacities from 3/8 inch in diameter by 12 feet in length up to 1 1/4 inches in diameter by 12 feet in length. 100

Van Keuren Carboly Plug Gages and Thread Measuring Wires

The Van Keuren Co., 178 Waltham St., Watertown 72, Mass., has recently added Carboly wire type plug gages and thread measuring wires to its line of precision gages. The Carboly wire type plug gages are made in sizes from 0.020 to 1/4 inch in diameter. The gaging units are 1 7/8 inches long for diameters up to and including 0.100 inch, and 2 inches long for diameters above 0.100 inch. They are made to Class B tolerance of plus or minus 0.000025 inch, or in coarser or finer tolerances as may be required. The gaging unit is held

in an aluminum handle by a split brass bushing and a socket set-screw.

Carboly wire type plug gages are recommended for checking small holes where the production runs are long or the material to be gaged is extremely abrasive. Carboly measuring wires for checking National 60-degree threads from 6 to 28 pitch are carried in stock. 101

Nelco Carboly-Tipped Twist Drills

The Nelco Tool Co., Inc., 370 Hamilton Ave., Brooklyn 31, N. Y., has just placed on the market a line of Carboly-tipped twist drills. These drills have been developed to permit faster cutting of plastics, ceramics, cast iron, and bronze. Unlike ordinary drills, which are dulled quickly when used on such abrasive substances, the Carboly-tipped product is said to have an extremely long life. The grinding of the carbide-tipped drills by the manufacturer to suit the material to be cut serves to increase their efficiency.

Properly ground Carboly-tipped drills can be used on glass and other materials that are too hard to be penetrated by steel drills. Although holes can be drilled in heat-treated steel, the manufacturer does not

recommend that the new drills be used for this purpose on a production basis. 102

Hardinge Collet-Holding Fixture

Hardinge Brothers, Inc., Elmira, N. Y., have just brought out two new collet-holding fixtures, designed to fill the demand for lower-cost fixtures, with stationary spindles for use in production work that does not require indexing. The bases of these fixtures are so designed that they can be used in either the horizontal or vertical position for drilling, milling, grinding, or broaching.

Both fixtures take standard 5C Hardinge collets, which are interchangeable with the Hardinge collet index fixtures. The 5C collet has a capacity for holding 1-inch round, 7/8-inch hexagon, and 3/4-inch square stock. The collets are operated by the lever collet-closer, which has a 100 to 1 leverage. The HV-H fixture, shown in Fig. 1, has an overall height in the vertical position of 5 inches, and a distance from the horizontal base to the center of the spindle of 4 inches. The HV-HN horizontal or vertical collet-holding fixture with a threaded-nose spindle, shown in Fig. 2, combines all the

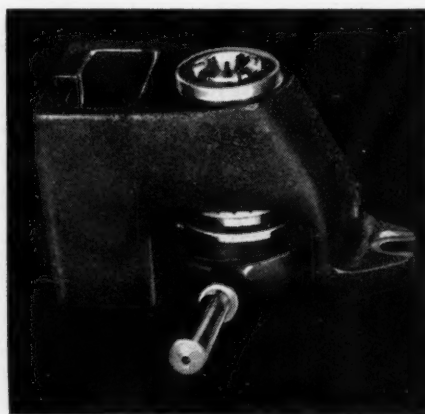


Fig. 1. Hardinge Collet-holding Fixture in Vertical Position

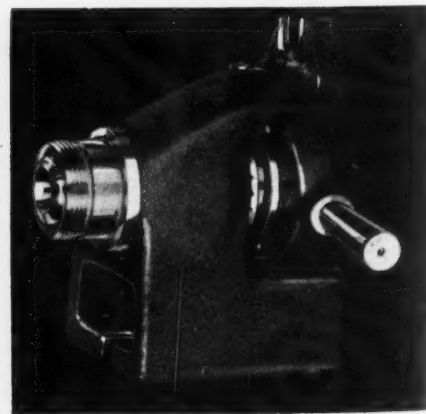


Fig. 2. Threaded-nose Collet Fixture in Horizontal Position

**THIS
LITTLE**

Wheel

**MAKES A BIG DIFFERENCE
IN PRODUCTION**



It's the Gisholt Hydraulic Speed Selector.

Through this one dial type control, the turret lathe operator can instantly shift to any one of 12 spindle speeds without stopping the spindle or releasing the main drive clutch. This means that no time is wasted in shifting gears—no calculations from cutting speed to spindle speed are necessary. When the job is set up and ideal machining speeds determined, with reference to the diameter of the work, the operator can pre-set the Speed Selector for each step in the machining process, merely touching a trip to effect each successive change.

Instant in response and power-operated, the Gisholt Hydraulic Speed Selector not only saves time between cuts but also increases production by making it simple for the operator to use the most efficient speed for each cut. It is available on all sizes of Gisholt Saddle Type and Ram Type Turret Lathes.

THE GISHOLT HYDRAULIC SPEED SELECTOR can be used in two ways: DIRECT or PRE-SET. Thus the operator can select each speed as desired by turning the wheel, or he can select the speed in advance of the change. Ask for full information.

**LOOK AHEAD... KEEP AHEAD...
WITH GISHOLT IMPROVEMENTS
IN METAL TURNING**

GISHOLT MACHINE COMPANY

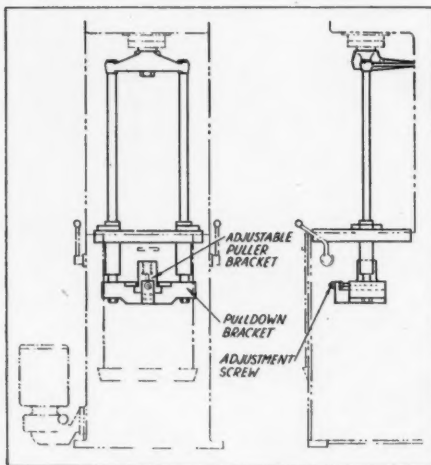
1209 East Washington Avenue, Madison 3, Wisconsin



features of the fixture illustrated in Fig. 1, in addition to the threaded-nose spindle. The over-all height of this fixture in the vertical position is 6 1/8 inches. 103

Adjustable Pull-Head for Off-Center Broaching

An adjustable pull-head which makes possible quick adjustment for off-center pull-broaching on Colonial

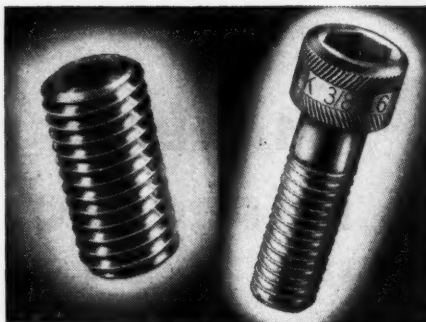


Diagrammatic View of Adjustable Pull-head for Off-center Broaching on Colonial Broaching Machine

"Utility" broaching machines has been brought out by the Colonial Broach Co., Detroit 13, Mich. With this equipment, the broaching of keyways and similar off-center work can be readily accomplished. The pull-head is interchangeable with the pull-down attachment available for Colonial "Utility," as well as Colonial "Junior" presses. In and out adjustment of the puller bracket is obtained by means of a screw equipped with locking nuts. 104

Parker-Kalon Ground-Thread Set-Screws and Size-Marked Cap Screws

The Parker-Kalon Corporation, 202 Varick St., New York 14, N. Y., is now manufacturing improved set-screws with Class 3 fit threads produced by centerless thread grinding. This application of centerless thread grinding, worked out in cooperation with the Landis Tool Co., gives the threads a smooth, bright finish, as indicated in the view to the left in the illustration. The threads are ground on the hardened stock, elim-



Parker-Kalon Improved Set-screw and Cap-screw

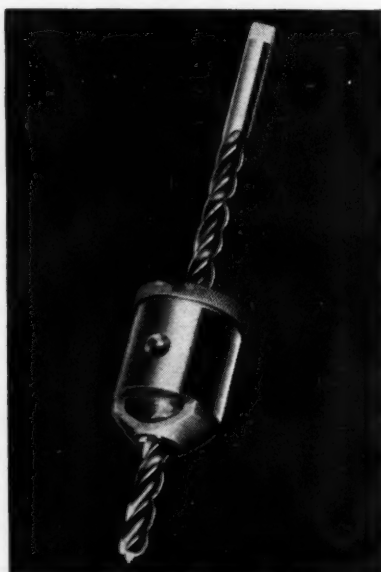
inating the need for subsequent heat-treatment.

In addition to the new ground-thread socket set-screw, the company has developed an improved cold-forged socket-head cap-screw. As shown in the view to the right, the improved cap-screw has a new "size-marked gear-grip" socket head, which permits the size of the screw thread to be read at a glance and which has serrations designed to prevent the cap-screw from slipping when held by the finger tips, even though it is covered with oil.

The advantages to socket-screw users claimed for the developments here described include faster assembling, and the saving of time in tool-rooms and on assembly lines. 105

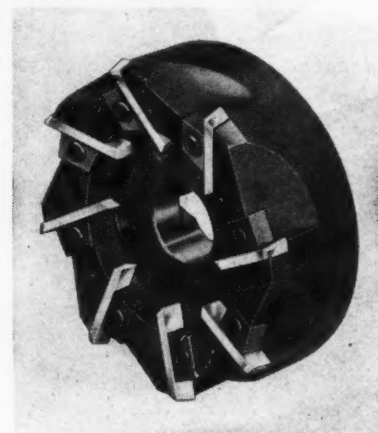
"Jet" Drill for High-Speed Production Drilling

A new type drill designed to operate at greatly increased speeds for mass production drilling has been



"Jet" Drill and Coolant Director

announced by the Republic Drill & Tool Co., 322 S. Green St., Chicago 7, Ill. Laboratory tests and actual production drilling records with this drill are said to have shown tremendously increased penetration speeds and greater accuracy. Stopwatch timing during test drillings with this new "Jet" drill, and its accompanying "Jet" coolant director, has shown an elapsed time of only 8 seconds in drilling a 3/8-inch hole to a depth of 4 inches. This high performance record is attributed to the use of a great volume of coolant under high pressure, and an entirely new principle in drill design which makes possible high spindle speeds and feeds. 106



"Universal Face Kennamill" Milling Cutter

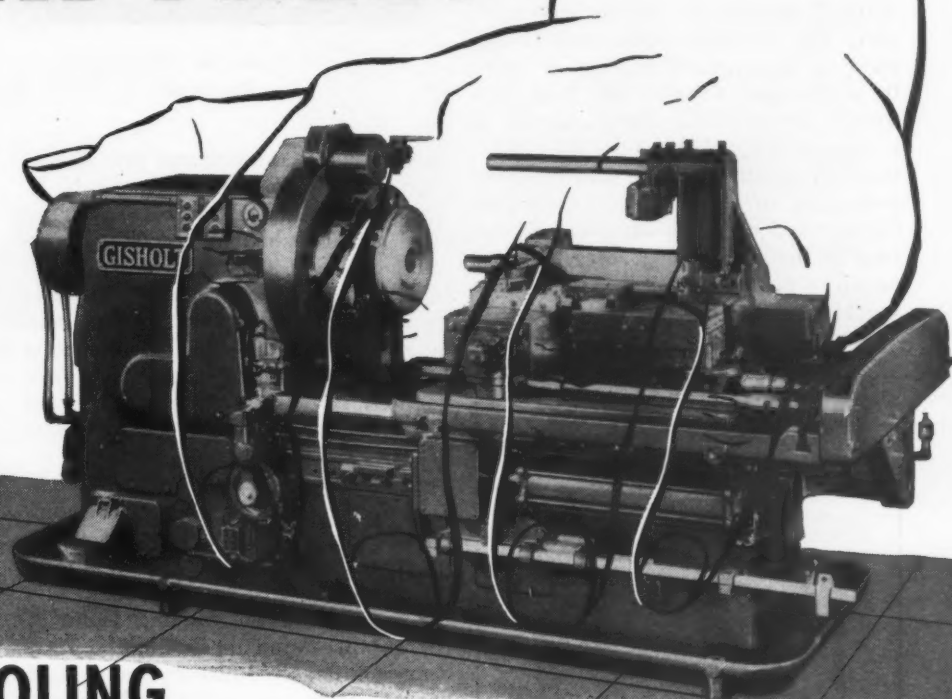
Kennametal Universal Face-Milling Cutters

Kennametal Inc., Latrobe, Pa., has developed a new type of milling cutter called the "Universal Face Kennamill," which consists of a precision-built heat-treated steel body or holder with a set of detachable solid Kennametal blades. The blades are held in position by mechanical means, the number of blades corresponding to the number of inches in the cutter diameter. These cutters are now available in five standard sizes ranging from 4 to 12 inches in diameter. The blades for these cutters are all the same in cross-sectional size, and when sharpened by regrinding, can be used successively in smaller holders. They are formed at both ends and can be used in either right- or left-hand cutter bodies.

These cutters can be adapted for milling different materials by simply interchanging the blades, which are made in the proper grades of carbide and with suitable cutting angles to

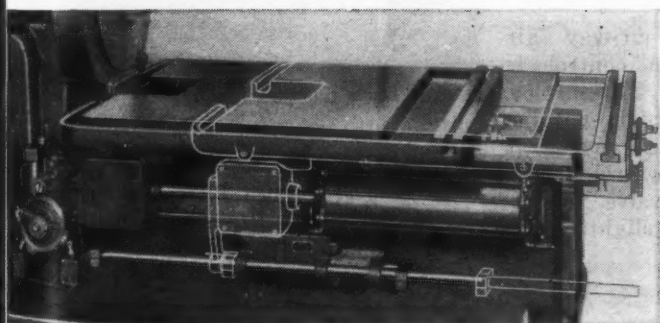
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... FOR
HEAVY, FAST
PRODUCTION



SIMPLIMATIC TOOLING

is supported by solid metal from the floor up!



THE SIMPLIMATIC PLATEN TABLE rests on and against hardened and ground steel ways and gibs. It has a fast, smooth traverse to and from cutting position, actuated by pneumatic cylinders.



VERTICAL HEAD TOOLING can be arranged instead of on horizontal platen table when desired. Here, too, you have maximum rigidity and solid support for tools right to the cutting edge.

The heavy platen table of the Simplimatic automatically locks after it traverses to cutting position. Thus it and all the tooling on it become virtually one piece with the bed.

Because of the freedom in positioning slides on the big platen table, tools can be held close to their cutting edges and favored in any way desired. Moreover, this freedom from chatter is permanent because slide top is mounted on hardened steel ways and gibs.

Combined with the solidity of the cutting tools is the precision-fitted spindle of large diameter, on widely spaced roller bearings and its large herringbone drive gear mounted close to the nose. There's no chance anywhere for vibration. Chatter is *designed out!*

That's why Simplimatics can hold to extremely close tolerances, on large parts and at high production speeds. Ask for complete information about the Simplimatics.

Look Ahead...Keep Ahead...with Gisholt

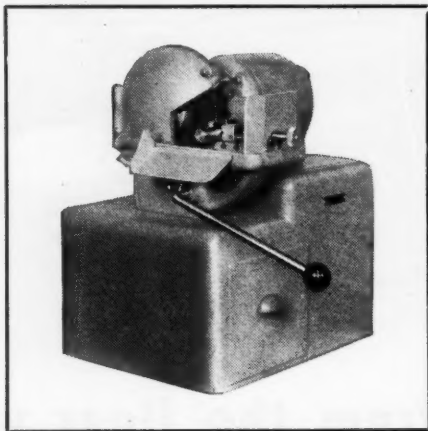


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1209 E. Washington Avenue, Madison 3, Wisconsin

THROTT LATHES • AUTOMATIC LATHES • CHAPERINING MACHINES • ROLLERS • SPECIAL MACHINES

meet various requirements. When the blades become dull, they can be removed from the body or tool-holder while it remains in the machine spindle. The removed blades are sharpened on a standard surface grinder by a diamond wheel while held in a fixture or grinding block placed on a magnetic chuck in successive positions to obtain accurate and uniform reshaping of the tool to the various cutting and clearance angles. Resetting of the sharpened blades by hand requires no special skill, and can be quickly accomplished.107



Abrasive Cut-off Machine Added to the Line of Buehler, Ltd.

Buehler Abrasive Cut-Off Machine

A 1-H.P., table-model, abrasive cut-off machine has just been added to the line of metallurgical laboratory equipment made by Buehler, Ltd., 165 W. Wacker Drive, Chicago 1, Ill. This No. 1015 machine is designed to meet the need for a high-grade cut-off machine at a moderate price. It occupies only a small space, yet is capable of cutting metal samples from stock up to 1 inch in size. Coolant is supplied by a recirculating tank, which can be placed on the floor with hose connections to the abrasive cutter. Although designed primarily for use in the metallurgical laboratory, this cutter is also adaptable for general industrial use where precision and accuracy are required.108

Super-Light Miniature Ball Bearings

A new series of super-light miniature ball bearings with an outside diameter of 5/16 inch and bores of 7/32, 3/16, 5/32, and 1/8 inch is



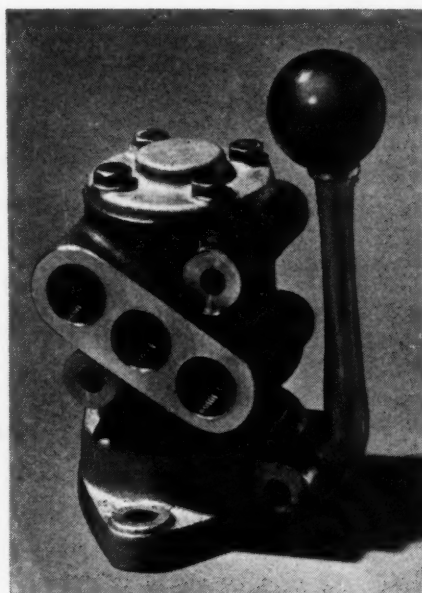
Actual-size Views of "Miniature" Ball Bearings

now being manufactured by Miniature Precision Bearings, Keene, N. H. They are made of chrome-bearing steel, and finished to precision tolerances of plus 0.0000, minus 0.0002 inch. From the actual-size views shown in the illustration, it will be seen that these bearings occupy a very small space, and thus are adapted for use in many restricted places where anti-friction bearings are an important factor.

These bearings are especially suitable for use in small motors, computers, electronic equipment, drive movements of recording devices, testing and laboratory equipment, and for supporting the moving parts of various precision mechanisms. They carry unusually heavy loads, and operate at exceptionally high speeds, considering their size.109

Handle-Grip Air Control Valve

A new 1/2-inch four-way air valve with handle-grip control is being manufactured by Pneumatics, Inc., Plymouth, Ind., which contains a detention spring that makes it possible to mount the control in any fixed position. This valve is extremely compact, being slightly over

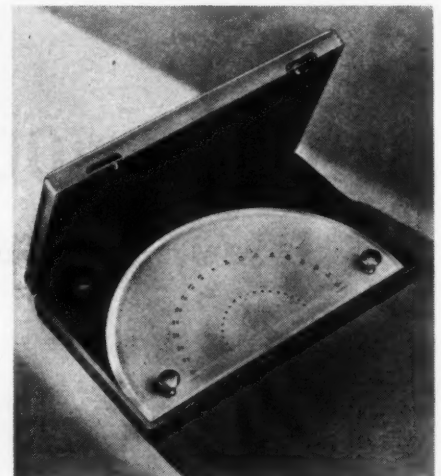


Four-way Air Valve with Handle-grip Control Made by Pneumatics, Inc.

5 inches high, 4 inches deep, and 3 inches wide. It has full, unrestricted ports, and is designed for fast operation. The same valve can be furnished for operation by palm, foot, cam, pilot, or solenoid.110

Universal Lay-Out Protractor

A lay-out protractor with division increments of 10 minutes has been brought out by the Engineers Specialties Division, Universal Engraving & Colorplate Co., Inc., 980 Elliott St., Buffalo 8, N. Y., for those requiring an extremely accurate protractor for use on optical projectors and form grinders. The ruled graduations of this protractor are on the



Universal Beveled Plate Glass Protractor for Precision Lay-out and Measuring Work

under side of the 1/4-inch beveled plate glass, of which it is composed. This assures accuracy of measurement, since the ruled lines of the protractor are in actual contact with the lay-out work or the lines being checked.111

* * *

New Officers of Material Handling Society

The Material Handling Society, 1117 Wolfendale St., Pittsburgh 12, Pa., recently announced the election of the following officers: President, T. O. English, Aluminum Co. of America; first vice-president, Samson A. Huey, P. Duff & Sons; second vice-president, W. B. Pritchard, Jeffrey Mfg. Co.; and executive secretary, Richard Rimbach, Materials Publishing Co.

LEADERSHIP

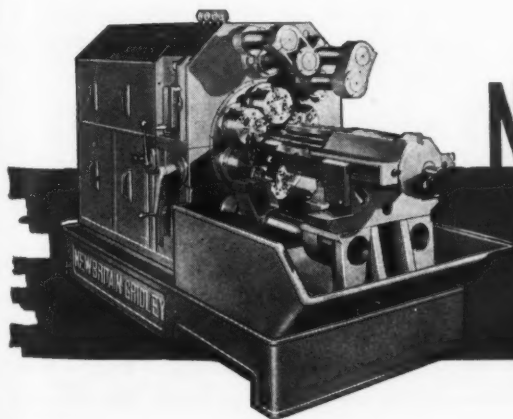
PROVED BY HUNDREDS
OF CASE HISTORIES...



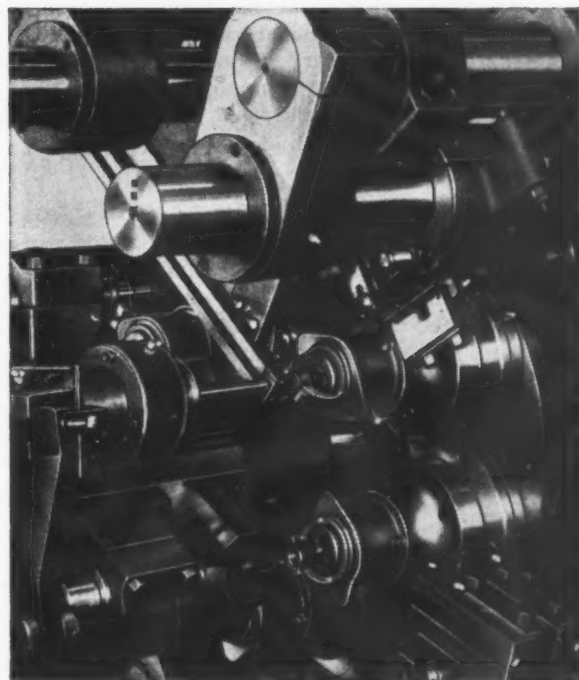
An excellent example of the advantages of New Britain exclusive features is the machining of the starter housing illustrated above. The longitudinal motion of the swinging type forming arm, (an exclusive feature of New Britain Multiple Spindle Automatic Chucking Machines) does the necessary back boring, making it unnecessary to handle this operation on another machine.

The piece is turned and bored within limits of plus or minus .001, and the finished part fits perfectly without the need of further machining. Another interesting feature of the job is a bushing, magazine fed, inserted in the fifth position, and broached in the sixth while the back boring and back turning are being done. Still another feature is the installation of a swinging stop on the first position to regulate the correct distance to the tools . . . a fool-proof aid to the machine operator. Sixteen operations are performed in a single cycle, and only 15.5 seconds are required to convert the rough casting into a finished part . . . 232 pieces per hour.

When you make the investment required to purchase automatic chucking or bar machines, be sure you get the adaptability of New Britains. They will maintain high production and low cost per piece, even on unusual requirements. The New Britain sales engineer in your area will be happy to show you how New Britain exclusive features can be used to advantage in connection with your automatic chucking machine requirements.



FRONT VIEW—Entirely open end construction provides accessibility for simplified chucking, cutting tool and attachment setup.



REAR VIEW—Wide open end construction provides extra large chip space . . . accessibility from three sides and from above that permits excellent visibility and easy tool adjustment.

NEW BRITAIN AUTOMATICS

THE NEW BRITAIN MACHINE COMPANY

NEW BRITAIN, CONNECTICUT

NEW BRITAIN-GRIDLEY MACHINE DIVISION

New Trade Literature

RECENT PUBLICATIONS ON MACHINE SHOP EQUIPMENT, UNIT PARTS, AND MATERIALS

To Obtain Copies, Fill in on Form at Bottom of Page 225 the Identifying Number at End of Descriptive Paragraph, or Write Directly to Manufacturer, Mentioning Catalogue Described in the March, 1946, Number of MACHINERY

Dowel-Pin Drill and Reamer Chart

DANLY MACHINE SPECIALTIES, INC., 2112 S. 52nd Ave., Chicago 50, Ill. Chart (6 1/4 by 10 inches) listing the sizes of Danly precision dowel-pins, and containing drilling and reaming instructions for doweling in cast iron and steel. The charts are available on heavy and light stock—plain or varnished finish; toolmakers and engineers can obtain copies by writing to the company directly and specifying the stock and finish desired.

Lathe Converter

MASTER MFG. CO., Hutchinson, Kan. Catalogue 10 and Operating and Maintenance Manual on the Lathe Converter, by means of which an engine lathe is transformed into a machine that can perform almost any type of machining operation. Also folder entitled "Lathe Converter—A Complete Metal-Working Machine for Maintenance, Repair, Toolmaking, and Experimental Work." 1

Photo-Copying Equipment and Materials

HUNTER ELECTRO-COPYIST INC., Syracuse, N. Y. Bulletin describing how the Hunter "Electro-Copyist" saves hours in the preparation and reproduction of plant lay-out prints for reconversion. Circular describing "Heccolith," a sensitized paper negative for reproducing engineering drawings. 2

Punching, Shearing, and Bending

BUFFALO FORGE CO., Buffalo 5, New York. Bulletin entitled "Punching, Shearing, and Bending," containing the reprint of a series of ar-

ticles by C. Tucker, assistant chief engineer of the company, which originally appeared in Hitchcock's "Machine Tool Blue Book." 3

Milling, Grinding, and Broaching Machines

CINCINNATI MILLING AND GRINDING MACHINES, INC., Cincinnati 9, Ohio. General catalogue M-1420, covering Cincinnati milling, grinding, broaching, lapping, and cutter-sharpening machines; gives complete constructional details, including specifications. 4

Stainless-Steel Handbook

ALLEGHENY LUDLUM STEEL CORPORATION, Brackenridge, Pa. Handbook of 100 pages, 5 by 7 1/2 inches, containing data on twenty-six types of stainless steel—their analyses, properties, available forms and sizes, heat-treatment, and fabrication methods. 5

Gear-Shaving Machines

NATIONAL BROACH & MACHINE CO., 5600 St. Jean Ave., Detroit 13, Mich. Bulletin RS45-11, entitled "Red Ring Roto Shaving Does a Better Job Faster." Bulletin SP45-11, entitled "Involute Splines for Modern Production," including design data. 6

Press-Brake Dies

CYRIL BATH CO., 6955 Machinery Ave., Cleveland 8, Ohio. Catalogue D-22, entitled "Metal-Forming Dies—Special Machinery," containing line illustrations showing many typical press-brake dies and table of pressure required for bending. 7

Haynes Alloys

HAYNES STELLITE CO., UNIT OF UNION CARBIDE AND CARBON CORPO-

RATION, Kokomo, Ind. Bulletins entitled "Hastelloy Facing for Corrosion Resistance," and "Haynes Alloys—Castings, Rolled Forms, Welding Rods, Metal-Cutting Tools." 8

Universal Joints

AMERICAN GEAR & MFG. CO., 6633 W. 65th St., Chicago 38, Ill. Bulletin 320, listing the outstanding construction features of the new "White Line" universal joints; complete specifications are included. 9

Hole-Punching Units

WALES-STRIPPIT CORPORATION, 345 Payne Ave., North Tonawanda, N.Y. Catalogue BL, descriptive of Wales Type BL interchangeable hole-punching units for punching sheet metal up to 1/8 inch thick. 10

Nickel Alloys

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y. Revised List "A" of current publications on nickel-alloy steels, nickel cast irons, nickel brasses and bronzes, and other nickel alloys. 11

Heat-Treatment Service

LUKENS STEEL CO., 281 Lukens Bldg., Coatesville, Pa. Circular 281, describing Lukens heat-treatment service, which includes stress relieving, annealing, normalizing, hardening, tempering, etc. 12

Silent Stock Tube

CORLETT-TURNER CO., 4011 W. Lake St., Chicago 24, Ill. Circular 1245, descriptive of the C-T silent stock tube for single- and multiple-spindle automatic screw machines. 13

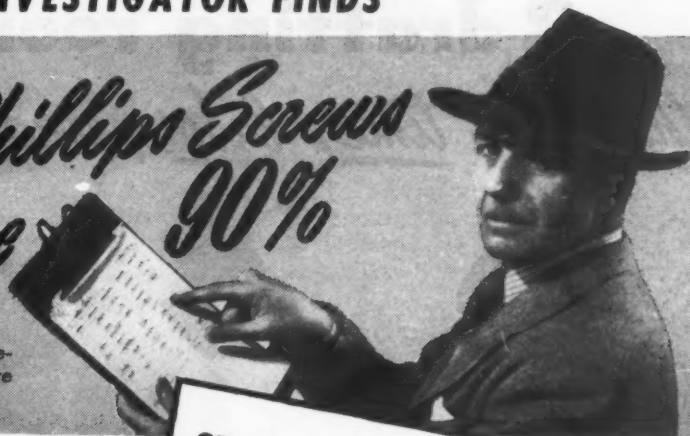
Shock-Absorbing Mounting

ROBINSON AVIATION, INC., 730 Fifth Ave., New York 19, N. Y.

INDEPENDENT INVESTIGATOR FINDS

*Sonotone uses Phillips Screws
to reduce case breakage 90%*

This investigator from James O. Peck Co., industrial research authorities, is visiting a number of representative plants to get authentic **FACTS** on assembly savings.



**Every driver skid eliminated
saves \$1.35 reclaiming costs!**

**GET HIS FACT FILLED REPORTS
... GET THE COMPLETE STORY**

SONOTONE CORPORATION uses Phillips Screws because they lower costs and improve the product... the same simple but all-important reason why thousands of other successful manufacturers use them.

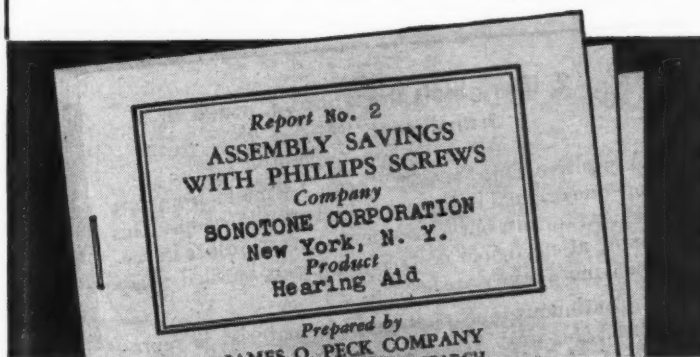
TO GET THE FACTS, to determine the actual savings, the investigator studied Sonotone's assembly methods, asked the same questions you would ask. He was told that, with slotted screws, breakage of the fine, hard plastic case of the Sonotone hearing aid would be ten times greater than with Phillips screws. Reclaiming, which involves not only the cost of a new case half, but also the cost of disassembly, reassembly and careful matching up of



case halves, amounted to \$1.35 per unit. The burr-free, ornamental Phillips recess is another reason why Sonotone chose Phillips Screws. Read the complete, revealing story in the Sonotone report.

THE ASSEMBLY STUDIES cover all types of products—metal, plastics, wood—show how the many Phillips Screw advantages add up big savings you can make in your assemblies.

THE REPORTS now ready—and more to come—comprise a practical manual of modern assembly methods, never-before-printed information, inside facts you'd pay good money to get,—and it's yours, now, **FREE!**



PACKED WITH IDEAS FOR SAVINGS IN YOUR ASSEMBLIES!

Whatever you make you'll find how all assemblers licked problems like your own. Get these reports. The coupon will bring those ready now, and the rest as they are issued. Fill it in and mail it—**TODAY!**



PHILLIPS *Recessed Head* SCREWS

Wood Screws • Machine Screws • Self-tapping Screws • Stove Bolts

American Screw Co.
Atlantic Screw Works
Atlas Bolt & Screw Co.
Central Screw Co.
Chandler Products Corp.
Continental Screw Co.
Corbin Screw Div.
Eico Tool & Screw Corp.
The H. M. Harper Co.
International Screw Co.
Lamson & Sessions Co.

27 SOURCES

Manufacturers Screw Products
Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
New England Screw Co.
Parker-Kalon Corp.

Pawtucket Screw Co.
Pheoli Manufacturing Co.
Reading Screw Co.
Russell Burdall & Ward
Bolt & Nut Co.
Seovill Manufacturing Co.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
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Wolverine Bolt Co.

PHILLIPS SCREW MFRS.,
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2300 Industrial Trust Bldg., Providence, R. I.

Please send me the reports on Assembly Savings
with Phillips Screws

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Company.....

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2 drafting room techniques *that save time, labor, and dollars in the office!*



Ever stop to think why a Draftsman *always* draws on translucent paper?

It's done so that reproductions can be made quickly in an Ozalid machine, or in blueprint or similar equipment.

In these units, light rays penetrate the original, exposing sensitized paper beneath. Then, the print is developed.

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OZALID

DIVISION OF GENERAL ANILINE AND FILM CORPORATION
JOHNSON CITY, NEW YORK

Ozalid in Canada—Hughes Owens Co., Ltd., Montreal



Catalogue entitled "Vibration Control Engineered by Robinson," describing "Vibrashock" unit mounts and their application in vibration control. 14

Recording and Controlling Instruments

BRISTOL Co., Waterbury 91, Conn. Catalogue W1800, covering the Bristol line of automatic controlling, recording, and indicating instruments. 15

Welded Fabrication

UNITED WELDING Co., Middletown, Ohio. Engineering manual entitled "Tailoring in Metal," discussing the factors affecting the choice of welded fabrication and the techniques of welded design. 16

Lifting Magnets

ELECTRIC CONTROLLER & MFG. Co., 2700 E. 79th St., Cleveland 4, Ohio. Bulletin 904, describing E C & M circular magnets for lifting applications requiring a small-sized magnet of minimum weight. 17

Cutting Fluids

D. A. STUART OIL Co., LTD., 2739 S. Troy St., Chicago 23, Ill. Bulletin entitled "Water-Mixed Cutting Fluids," containing information on various soluble oils and their applications. 18

Precision Casting

AUSTENAL LABORATORIES, INC., 5932 S. Wentworth Ave., Chicago 21,

Ill. Booklet entitled "Microcast Process," describing a method of producing precision castings of intricate design. 19

Oil-Hardening Tool Steel

CRUCIBLE STEEL Co. OF AMERICA, 405 Lexington Ave., New York 17, N. Y. Data sheet on Ketos oil-hardening, non-deforming tool steel—its composition, applications, and heat-treatment. 20

Vinylite Elastomeric Plastics

BAKELITE CORPORATION, UNIT OF UNION CARBIDE AND CARBON CORPORATION, 30 E. 42nd St., New York 17, N. Y. Booklet describing industrial applications of Vinylite Elastomeric compounds. 21

Industrial Air-Conditioning Equipment

RAYTHEON MFG. Co., Waltham 54, Mass. Catalogue descriptive of the Raytheon "Precipitator," for removing airborne dirt and dust in industrial plants. 22

Welding Electrodes

ECCLES & DAVIES MACHINERY Co., INC., Los Angeles 21, Calif. Booklet on Edco phosphor-bronze electric welding electrodes, giving welding techniques for various classes of metals. 23

Automatic Clutch

SALSBUURY MOTORS, INC., 4464 District Blvd., Los Angeles 11, Calif. Bulletin 4501, describing a new

automatic clutch with centrifugal action, designed to eliminate starting shock. 24

Pressure-Operated Switches

MELETRON CORPORATION, 950 N. Highland Ave., Los Angeles 38, Calif. Catalogue descriptive of George A. Starbird pressure-operated switches for use in aircraft, industrial, and marine service. 25

Oxy-Acetylene Cutting of Cast Iron

NATIONAL CYLINDER GAS Co., 205 W. Wacker Drive, Chicago 6, Ill. Circular N-606, describing how to cut cast iron successfully with the oxy-acetylene flame. 26

Recording and Indicating Instruments

FOXBORO Co., Foxboro, Mass. Catalogue 370, on the company's complete line of recording and indicating instruments for measurement and control. 27

Coated Electrodes

METAL & THERMIT CORPORATION, 120 Broadway, New York 5, N. Y. Bulletin descriptive of the new Murex line of heavy-coated bronze electrodes and their applications. 28

Wheel-Tread Grinder

AMERICAN CAR & FOUNDRY Co., 30 Church St., New York 8, N. Y. Operating manual on the ACF high-speed grinder for grinding the tread on railway car wheels. 29

To Obtain Copies of New Trade Literature

listed on pages 222-226 (without charge or obligation), fill in below the publications wanted, using the identifying number at the end of each descriptive paragraph; detach and mail within three months of the date of this issue to:

MACHINERY, 148 Lafayette St., New York 13, N. Y.

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Name.....Position or Title.....

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Firm.....

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City.....State.....

[SEE OTHER SIDE]

Hydraulic Cylinders

LOGANSPOUT MACHINE CO., INC., 910 Center Ave., Logansport, Ind. Catalogue 84, on the new line of Logan Rotocast hydraulic cylinders; includes engineering data.30

Ampco Metal for Dies

AMPCO METAL, INC., 1745 S. 38th St., Milwaukee 4, Wis. Bulletin 58, describing and illustrating the use of the aluminum-bronze alloy Ampco Metal in dies.31

Magnetic Chucks

HANCHETT MFG. Co., Big Rapids, Mich. Bulletin 045-1, describing in detail the complete line of "Hermeti-Coil" electromagnetic chucks and accessories.32

Universal Miller-Shaper

COCHRANE-BLY Co., 19 St. James St., Rochester 2, N. Y. Circular entitled "In a Retooling Jam?", describing the Cochrane-Bly universal miller-shaper.33

Casehardening

SURFACE COMBUSTION CORPORATION, Toledo 1, Ohio. Bulletin SC-127, descriptive of casehardening in this company's standard rated furnaces.34

Gages

CADILLAC GAGE Co., 20316 Hoover Road, Detroit 5, Mich. Circular illustrating and describing Cadillac's new high-precision "Pla-Chek" for surface plate inspection work.35

Flash Welders

PROGRESSIVE WELDER Co., 3050 E. Outer Drive, Detroit 12, Mich. Bulletin descriptive of a new line of flash welders, adapted for both flash and butt welding.36

Drill Sharpener

MAJESTIC DRILL SHARPENER Co., 1100 Second Ave. S., Minneapolis 2, Minn. Folder descriptive of the Majestic drill sharpener designed for accurate and fast operation.37

Indicator Light Reference Book

GOTHARD MFG. Co., 2110 Clear Lake Ave., Springfield, Ill. Reference book containing information on the selection, operation, and maintenance of indicator lights.38

Center Drills

HOWARD H. HEINZ, INC., 318 Boulevard Bldg., Detroit 2, Mich. Folder describing the new "Hy-Co" center drill, designed to prevent drill breakage and work spoilage.39

Welding Motor Frames

AMERICAN WELDING & MFG. Co., Warren, Ohio. Bulletin descriptive of the application of welding to the manufacture of alternating- and direct-current motors.40

Self-Locking Nut

GRIP NUT Co., 310-Y S. Michigan Ave., Chicago 4, Ill. Circular illustrating and describing a new one-piece self-locking nut for industrial applications.41

Brazing Furnaces

LINDBERG ENGINEERING Co., 2450 W. Hubbard St., Chicago, Ill. Bulletin 210, on Lindberg continuous-production brazing furnaces.42

Industrial X-Ray Equipment

NORTH AMERICAN PHILIPS Co., INC., 100 E. 42nd St., New York 17, N. Y. Booklet IXE, on Norelco industrial X-ray equipment.43

Machining Plastics

DUREZ PLASTICS & CHEMICALS, INC., North Tonawanda, N. Y. Booklet entitled "Machining Data on Phenolic Plastics."44

Arc-Welding Electrodes

HOBART BROTHERS Co., Troy, Ohio. Folder DM-710, announcing the Hobart complete post-war line of arc-welding electrodes.45

Turbine Oil

GULF OIL CORPORATION, 3800 Gulf Bldg., Pittsburgh 30, Pa. Booklet entitled "Gulferest Oil for Steam Turbine Lubrication."46

Fractional-Horsepower Motors

ELECTRIC INDICATOR Co., Stamford, Conn. Bulletin FB on Elinco Type FB fractional-horsepower motors and generators.47

Heat-Treating Furnaces

HEVI DUTY ELECTRIC Co., Milwaukee, Wis. Bulletin HD 1245, entitled "Hevi Duty Pit Type Convection Furnaces."48

To Obtain Additional Information on Shop Equipment

Which of the new or improved equipment described on pages 187-220 is likely to prove advantageous in your shop? To obtain additional information or catalogues about such equipment, fill in below the

identifying number found at the end of each description—or write directly to the manufacturer, mentioning machine as described in March, 1946, MACHINERY.

No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
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To Obtain Additional Information on Materials of Industry

To obtain additional information about any of the materials described on pages 184-185, fill in below the identifying number found at the end of each

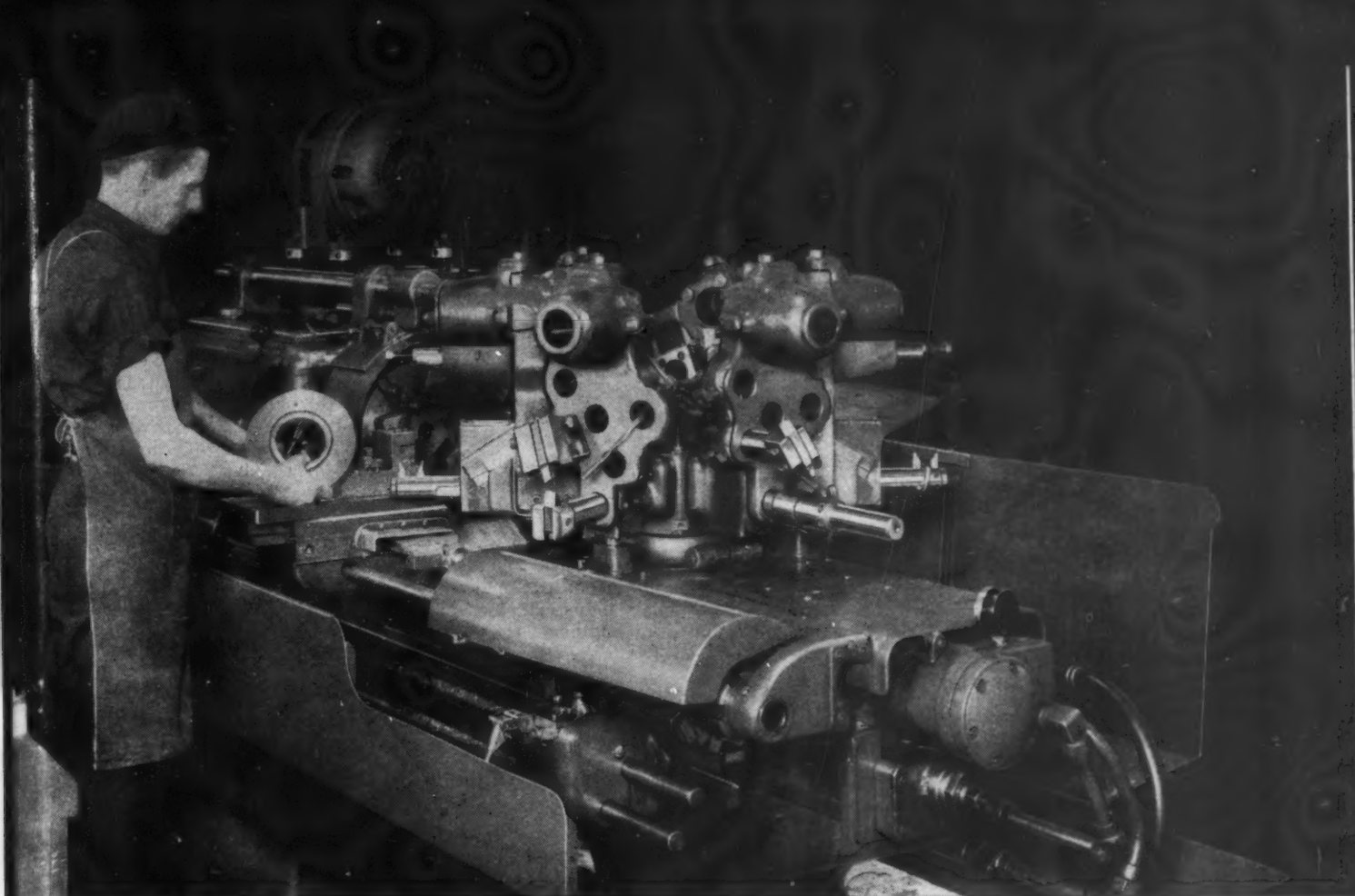
description—or write directly to the manufacturer, mentioning name of material as described in March, 1946, MACHINERY.

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[SEE OTHER SIDE]



How the **FASTERMATICS** Pay Out Faster, too!

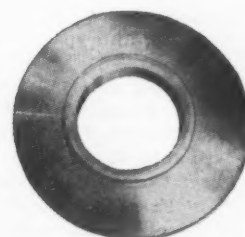
It may seem incredible, in this day and age, for any major machine tool to "buy" itself in nine weeks' operation. Yet that's exactly what the Fastermatic did on this job of machining clutch plate hubs.

With automatic control of all machine functions, this Fastermatic reduced the former time of 15 minutes per piece, on hand-operated turret lathes, to only 3 minutes, floor to floor. Savings piled up so fast over former production costs that the Fastermatic paid for itself in only 9 weeks, or 893 hours of operation.

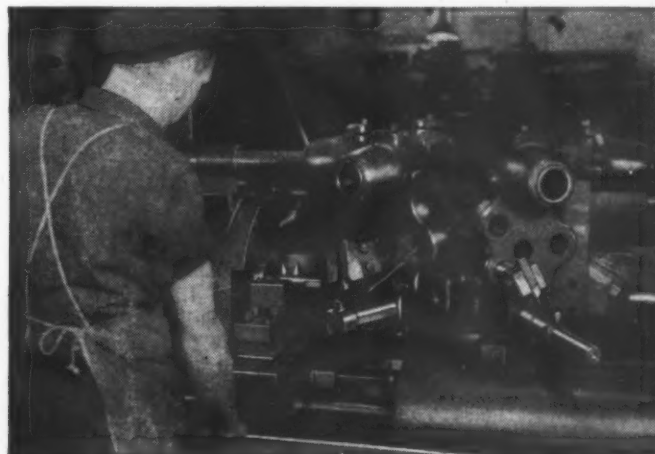
If you have work that will permit a number of cuts to be done in one chucking, investigate what the Fastermatic can accomplish to bring you faster, more efficient production and lower costs. Ask for full information.



Rough Steel Forging



Machined Clutch Plate Hub



In this tooling set-up, only three turret faces are needed to turn each part. By repeating the tooling on the remaining three faces of the hexagon turret, two parts are machined with each complete turret cycle. The operator has only to load and remove the work.



GISHOLT MACHINE COMPANY

1209 E. Washington Ave. • Madison 3, Wisconsin

Look Ahead...Keep Ahead...with Gisholt

News of the Industry

Canada

INTERNATIONAL NICKEL CO. OF CANADA, LTD., announces the formation of a Development and Research Section at 25 King St. W., Toronto, Canada. This section of the company will be staffed by DR. GORDON S. FARNHAM, A. S. TUTTLE, and H. J. BUTTERILL. The function of the new section will be to extend to Canadian industry a complete consulting and technical service on metal problems, particularly on nickel and nickel alloys.

California

A. K. TOOL CO., 2029 Blake Ave., Los Angeles, Calif., precision machine and tool maker, announces the purchase of the patents and manufacturing rights of the NEWTON CO., maker of the Newton Automat, which converts hand-operated turret lathes into automatics, the Newton bar feed, hole cutter, and self-indexing turret.

CONSOLIDATED VULTEE AIRCRAFT CORPORATION, San Diego, Calif., announces that it has purchased a controlling interest from the AMERICAN CAR & FOUNDRY CO., in the ACF-BRILL MOTORS CO., and its wholly owned subsidiary, the HALL-SCOTT MOTOR CAR CO. of California, manufacturer of motor buses, trolley coaches, and specialized engines.

HARVEY A. CRAIG has been made Pacific Coast manager of the Republic Steel Corporation, Cleveland, Ohio. Mr. Craig will supervise the territory served by all three Coast sales offices—at Los Angeles, San Francisco, and Seattle—and will also retain his position as manager of the Los Angeles office.

L. E. BIGGIE has been appointed regional manager of the Putnam Tool Co., Detroit, Mich., at the West Coast area sales office of the company, with headquarters at 901 N. Cedar St., Glendale 7, Calif. He was previously associated with the Ford Motor Co.

Illinois

W. R. WHITE, JR., vice-president of the Midwestern Tool Co., Chicago, Ill., has been appointed by Secretary Wallace to serve on the Small Business Advisory Committee of the Department of Commerce. Mr. White is a director of the National Tool and Die Manufacturers Association, Cleveland, Ohio, and was recently elected president of the Tool and Die Institute of Chicago.

PAUL CONN, who has recently been released from service in the U. S. Navy, has been named manager of the Lake-

side Tool Corporation, 628 W. Lake St., Chicago, Ill., subsidiary of the LaSalle Engineering Co. of Chicago. Mr. Conn will have direct charge of the machine shop.

STEPHAN D. GARST has joined the staff of Bjorksten Laboratories, 185 N. Wabash Ave., Chicago 1, Ill., as chemical metallurgist. He was previously connected with the Dodge Chicago plant of the Chrysler Corporation.

EUGENE T. SCOTT has joined Templeton, Kenly & Co., Chicago, Ill., manufacturers of Simplex industrial jacks, as product application engineer. He was recently released from the Naval Air Force.

LIEUTENANT ROBERT S. AITCHISON, USNR, has rejoined the Lindberg Engineering Co., 2450 W. Hubbard St., Chicago 12, Ill., to take charge of the advertising department.

J. D. GARINGER was recently transferred from the Bay City Division of the Dow Chemical Co. to the Magnesium Sales Division at Chicago, Ill.

J. R. STROHM has been made district manager at Chicago, Ill., for the Copperweld Steel Co., Glassport, Pa.

Michigan

RAY MORRISSEY has joined the Cross Co., Detroit, Mich., in the capacity of vice-president in charge of sales. Mr. Morrissey was associated with the Cincinnati Milling Machine Co. for twenty nine years, having been direct factory representative since 1919, and eastern district manager since 1926.



Ray Morrissey, Newly Appointed Vice-president in Charge of Sales of the Cross Co.

CARBOLOY COMPANY, INC., Detroit, Mich., has created a new separate Die Sales Division. A. E. GLEN, until recently sales engineer for the company on special die applications, has been advanced to the position of manager of the new division. J. E. WELDY, assistant to the vice-president of the Carboloy Company for the last three years, has been appointed manager of distributor sales. HARRY CRUMP, who also was assistant to the vice-president, has been advanced to the position of chief tool sales engineer. G. M. CHANDLER, sales engineer in the Chicago district since 1937, has been appointed assistant to the vice-president in charge of sales.

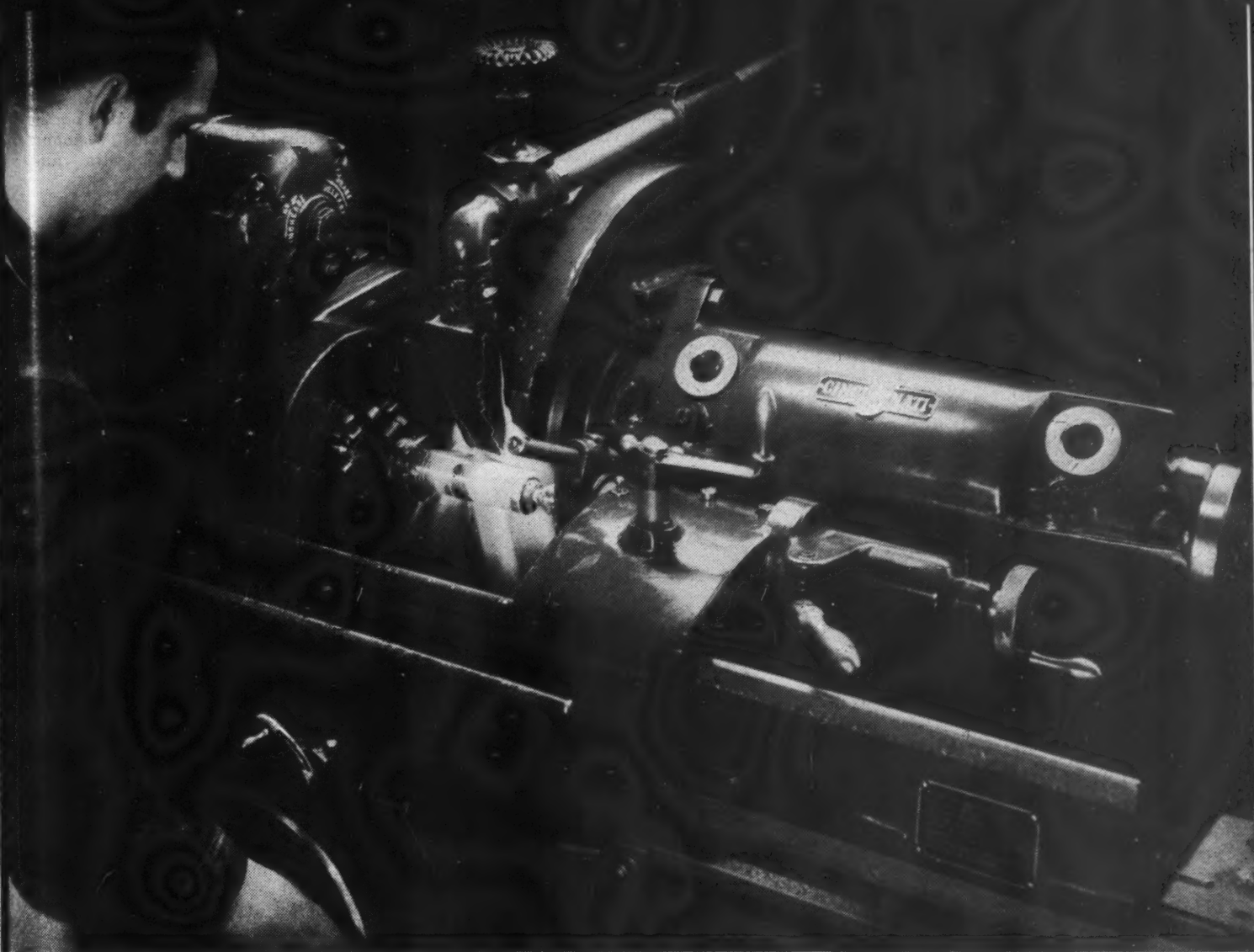
CARBOLOY COMPANY, INC., Detroit, Mich., announces that it has just completed the construction of a new metals plant, which will be in operation as soon as the necessary equipment has been installed. The new plant is located to the north of the present Carboloy plant on 8-Mile Road in Detroit. The former plant will be devoted exclusively in the future to the fabrication of carbide products. The increased floor space will permit the company to enlarge its training school, provide greater facilities for engineering and research, and pave the way for future expansion.

JOHN THOMPSON, INC., 428-429 Ford Bldg., Detroit 26, Mich., has been organized to function in the field of public relations, publicity, and related services by JOHN W. THOMPSON, former director of public relations for the Ford Motor Co. Mr. Thompson has purchased the business of LOU SMITH. PHILIP E. WILCOX, INC., 39 Park Ave., New York City, will be associated with the new organization.

GEROTOR MAY CORPORATION, Baltimore, Md., and Logansport, Ind., manufacturer of hydraulic pumps, motors, transmissions, and air-operated devices, announces the appointment of FORS & SAVAGE, INC., 2832 E. Grand Blvd., Detroit 11, Mich., as representative of the corporation in the metropolitan Detroit and adjacent territory.

COSA CORPORATION, Chrysler Bldg., New York 17, N. Y., has recently opened offices in Detroit, Mich., at 307 Boulevard Bldg., Suite 302-A. The new Detroit offices will be under the direction of ANTON P. JOEN. The Cosa Corporation represents in the United States many of the outstanding high-precision machine tool manufacturers of Switzerland, including Société Genevoise d'Instruments de Physique, Maag, Micron, Studer, etc.

HOWARD N. GIRARDIN has been appointed assistant to the president of the Empire Tool Co., Detroit, Mich. He will continue to hold the position of sales manager. HARLOW E. OHR, who has been



REMOVES .014" IN *One Pass*

SUNOCO EMULSIFYING CUTTING OIL...

Provides Outstanding Cooling, High Accuracy, Fine Finish

In every shop, a careful study of every factor influencing cutting or grinding efficiency will pay important dividends.

Here, for example, is a typical case in which the use of Sunoco Emulsifying Cutting Oil on a grinding-operation pays-off in fast production, high finish, great accuracy.

Operation: A short-traverse job, grinding cast-iron sleeve.

Machine: Cincinnati 10 x 36 Plain Hydraulic Grinding-Machine.

Material: Cast Iron.

Stock Removal: .014 inch.

Lubricant: 1 part Sunoco to 40 parts Water.

Sunoco makes possible faster metal-removal without increasing wheel-wear. Sunoco rapidly dissipates heat and helps prevent the loading or burning of wheels. Even at high surface-speeds, close tolerances and mirror-finishes are easily maintained.

For tough problems, involving petroleum products, for smooth cutting and grinding schedules, call the Sun Cutting Oil Engineer near you, today

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**INDUSTRIAL
PRODUCTS**

with the company since its organization in 1940, has been made director of production control and purchases.

BERT CONWAY, for the last three years vice-president in charge of manufacturing of the Aviation Corporation, Detroit, Mich., has become associated with Joseph W. Rothmeyer, of Detroit, a firm specializing in industrial and engineering surveys, plant lay-out and product processing, marketing and merchandising policies, manufacturing methods, etc.

KAYDON ENGINEERING CORPORATION, Muskegon, Mich., is making an addition to its McCracken St. plant which will provide an increase of about 12,000 square feet of floor space. The company, which made large gun-mount bearings during the war, has installed additional machinery for reconvertng to the manufacture of industrial bearings.

CHAMBERSBURG ENGINEERING COMPANY, Chambersburg, Pa., has appointed FRANK G. SHAUB, 14456 Scripps Ave., Detroit 15, Mich., Detroit representative of the company. Mr. Shaub was connected for twenty-five years with the Ford Motor Co., specializing in the maintenance of steel mill and forging equipment and forging die development.

M. R. UNDERWOOD is now affiliated with the Pioneer Engineering & Mfg. Co., 19669 John R St., Detroit 3, Mich., and has assumed the duties of director of purchases for this company, as well as for the Pioneer Pump & Mfg. Co.

TED NAGLE has been appointed director of sales and advertising of Hydraulic Machinery, Inc., Dearborn, Mich., and associated companies Superdraulic Corporation, Steel City Testing Laboratory, and Electro Mechanical Devices Co.

A. F. DOBBRODT has been appointed special products engineer by the Carboly Company, Inc., Detroit 32, Mich., to head a new division of that name. Mr. Dobbrodt was formerly Pittsburgh district manager for the company.

Missouri and Louisiana

WAGNER ELECTRIC CORPORATION, 6400 Plymouth Ave., St. Louis 14, Mo., announces the following changes in its factory management personnel: G. B. EVANS, general superintendent since 1921, has been promoted to plant manager, and will be succeeded by C. W. HESSE as general superintendent. Mr. Hesse was previously assistant general superintendent. W. A. OKENFUSS will take Mr. Hesse's place as assistant general superintendent.

INTERNATIONAL NICKEL CO., INC., 67 Wall St., New York 5, N. Y., announces the opening of the St. Louis technical section of its Development and Research Division in the Ambassador Building, 411 N. 7th St., St. Louis 1, Mo. The new section will be under the direction of GEORGE A. FISHER, JR.

PAN-AMERICAN ALLOYS, INC., New Orleans, La., manufacturers of aluminum alloy castings, have purchased the buildings formerly operated by the National Machine & Foundry Co. at Scottsdale, Pa. The new acquisition will enable the company to considerably enlarge its production facilities.

New England

ARTHUR H. STARRETT has been elected president of the L. S. Starrett Co., Athol, Mass. Mr. Starrett, of the third generation to be connected with the business, started with the company in 1902.



Arthur H. Starrett, Newly Elected President of the L. S. Starrett Co.

He was appointed master mechanic in 1920, was made a director in 1922, and became vice-president in 1939. DAVID FINDLAY, president for the last seven years, has retired after fifty-five years of service with the company. WILLIAM J. GREENE, vice-president in charge of sales since 1941, has been elected vice-president and director of sales.

R. H. CANNON has been appointed merchandising engineer for the Abrasive Division of the Norton Co., Worcester, Mass. He has been with the company for thirty years—for the last twenty-three years as abrasive engineer in the Ohio area. W. A. RUSSELL, who has just been released from the United States Navy, is taking over Mr. Cannon's former territory as abrasive engineer. Other abrasive engineers recently appointed include W. A. McCUNE, JR., in the New York-New Jersey area; N. V. CRABTREE, in the Michigan area; W. H. MCNEILLY, JR., in the St. Louis area; and J. L. TOBEY in the Connecticut area.

LODGE & SHIPLEY MACHINE TOOL CO., Cincinnati, Ohio, has appointed the RUDEL MACHINERY CO., INC., Boston,

Mass., exclusive sales representative and dealer for the company in the north-eastern area, including Maine, Vermont, New Hampshire, Massachusetts, and Rhode Island.

DR. D. S. EPPELSHEIMER has been appointed sales manager and chief physical metallurgist of Metal Hydrides, Inc., 16 Congress St., Beverly, Mass. Dr. Eppelsheimer was formerly in charge of a research project at the University of New Hampshire.

JOHN ARMOUR PORTER, formerly Commander, U.S.N.R., and recently with the Pan-American Airways, has joined Armour's Pattern Shop Co., Worcester, Mass., welding engineers, in the capacity of vice-president. He will also be a member of the board of directors.

RUSSELL L. PECK has been appointed refractories engineer by the Norton Co., Worcester, Mass. He will work with F. E. LEIBY, and will cover the territory comprising Philadelphia, Delaware, eastern Maryland, eastern Virginia, and eastern North Carolina.

KELLY REAMER CO., Cleveland 1, Ohio, announces the appointment of A. R. SHEVLIN, Park Square Bldg., Boston, Mass., as sales and engineering representative of the company for eastern Connecticut and the state of Rhode Island.

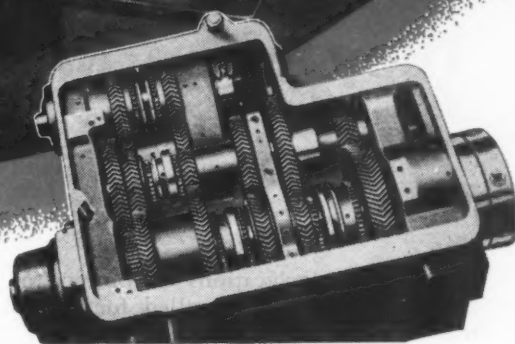
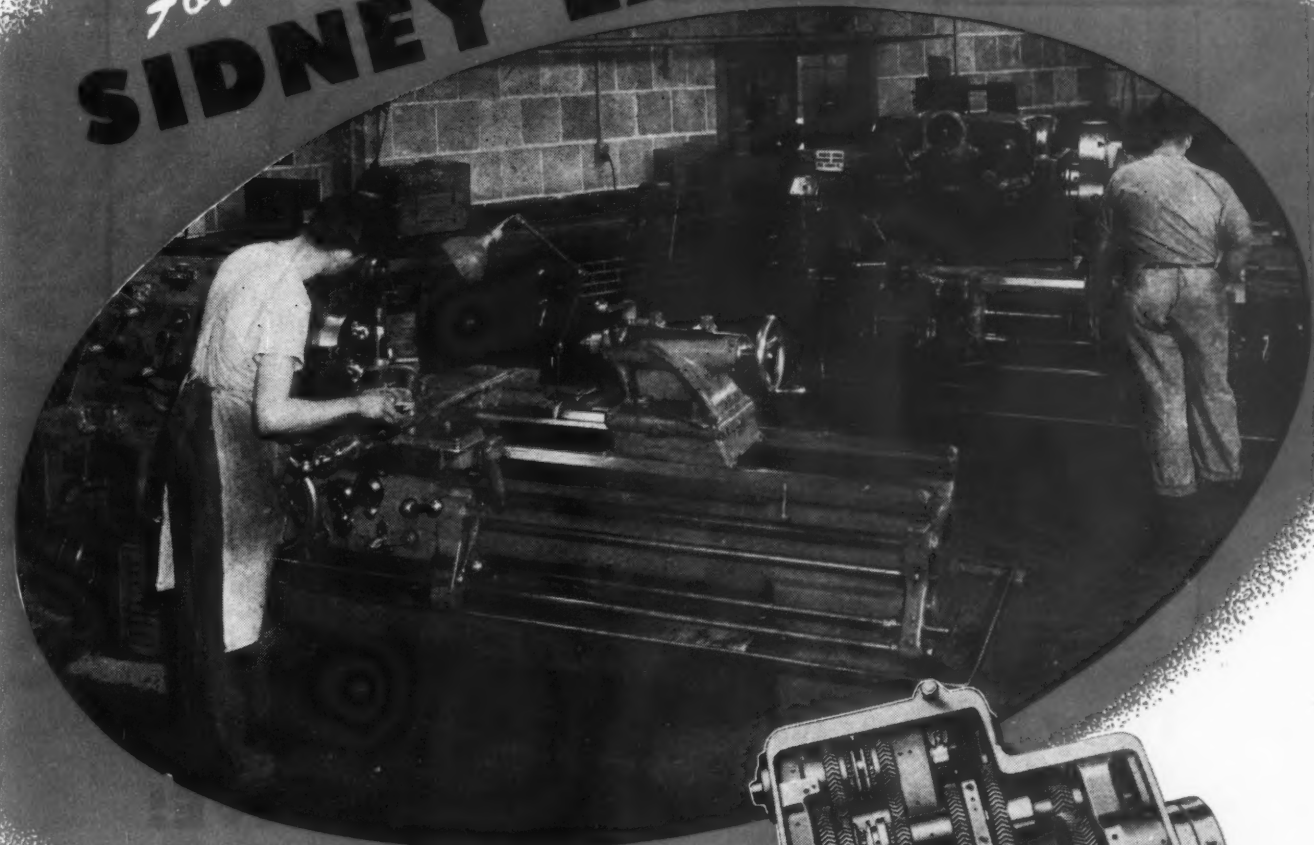
STAR ELECTRIC MOTOR CO., Bloomfield, N. J., announces the opening of a New England district office at 1430 Massachusetts Ave., Cambridge 38, Mass. ELLIOT W. KNIGHT has been appointed district manager.

EDWIN R. FELLOWS II has been appointed export manager of the Fellows Gear Shaper Co., Springfield, Vt. He will work directly under the supervision of C. M. PETER, general sales and service manager.



Edwin R. Fellows II, Recently Appointed Export Manager of Fellows Gear Shaper Co.

For Dependable Ordnance **SIDNEY LATHES**



CONTINUOUS TOOTH HERRINGBONE GEARED HEAD

This type of head perfected by Sidney has gained universal acceptance. This type of gearing provides more tooth contact, resulting in greater strength, smoother action with end thrust eliminated thru the opposed helix angle.

In meeting the varied and exacting needs of ordnance work Sidney Lathes are doing a really fine job.

The accompanying illustration shows a 20 inch and a 30 inch Sidney Lathe in a midwest ordnance plant.

Here again the Sidney four wall bed construction with cross girts at twelve inch intervals assures rigidity and freedom from vibration. The continuous tooth herringbone geared head furnishes a smooth flow of power ideally suited to the use of carboloy tipped tools often required for the high production of ordnance work.

Sidney 16 Speed Herringbone Geared Lathes are available in a range of sizes from 14 inch to 36 inch. Sixteen speeds and forty-eight changes of threads and feeds assure the operator of maximum possibilities with all types of cutting tools. Centralization of controls provides ease of operation from normal working position.

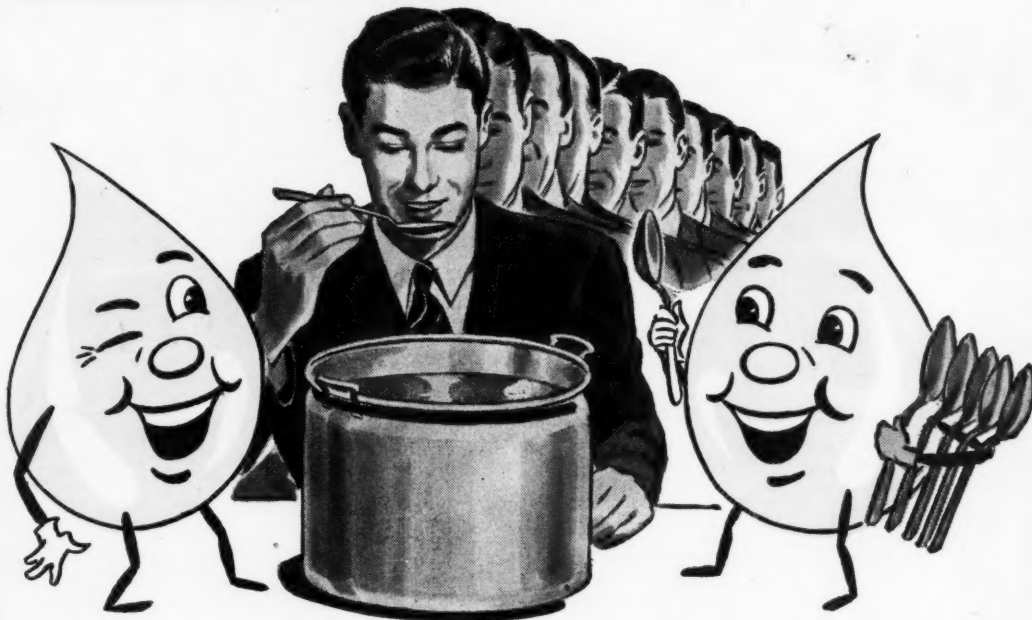
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MACHINE TOOL COMPANY
Builders of Precision Machinery
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**SHELL LUBRICATION ENGINEER as
the FIRST STEP to the RIGHT SOLUTION
of any LUBRICATION PROBLEM**



They even made a TASTE TEST of a SHELL RUST PREVENTIVE!

PROBLEM: Specifications in contract for making U. S. Army cooking kettles called for a protective coating that came off easily with cold water. Absolutely no taste or odor could remain. The manufacturer preferred a coating to be applied by dipping at room temperature.

SOLUTION: When the Shell Lubrication Engineer surveyed the problem, he recommended a Shell Ensis Oil. As a test, this material was applied to utensils of the plant cafeteria. These were washed in cold water—then placed in normal use. *Not one employee could detect the slightest trace of the Rust Preventive used.*

CONCLUSION: It pays to consult the Shell Lubrication Engineer, regardless of the nature or size of your lubricating problem. Write for a copy of Shell's 40-page booklet on Rust Preventives. Shell Oil Company, Incorporated, 50 West 50th Street, New York 20, New York; or 100 Bush Street, San Francisco 6, California.



No one really cares what a Rust Preventive tastes like, but the maker of U. S. Army cooking kettles had to be sure that the Rust Preventive could be completely removed so that it would not taste!

SHELL RUST PREVENTIVES

OILS . . . FLUIDS . . . COMPOUNDS





Seth H. Stoner, Assistant Chief Engineer of New Departure Division of the General Motors Corporation

SETH H. STONER has been appointed assistant chief engineer in charge of automotive and tractor applications for the New Departure Division of General Motors Corporation, Bristol, Conn. Previous to the war, he was executive engineer with this division.

A. L. ATHERTON has been appointed advisory engineer and FRED C. HEYL manager of the quality control department of the East Springfield, Mass., plant of the Westinghouse Electric Corporation.

STACKBIN CORPORATION announces the removal of its offices and factory to a plant recently purchased by the company at 1077-1089 Main St., Pawtucket, R. I.

New Jersey

W. A. FINN, who has just been released from the U. S. Navy, has been appointed export manager of the Worthington Pump & Machinery Corporation, Harrison, N. J., succeeding GEORGE GELLHORN. Mr. Gellhorn has become general manager of C. E. HALABY, one of Worthington's industrial machinery dealers in Colombia, South America.

I. C. SMITH has been appointed chief engineer of the Crocker-Wheeler Division of the Joshua Hendy Iron Works, Ampere, N. J. Prior to joining Crocker-Wheeler in 1942, he was in charge of direct-current motor and generator design with the Elliott Co., of Ridgway, Pa.

JAMES ADAIR JONES has joined the sales engineering staff of the Star Electric Motor Co., Bloomfield, N. J., and will represent the company in the New Jersey area. He was formerly connected with the Newark office of the Westinghouse Electric Corporation.

BROOKS EQUIPMENT CORPORATION, designer and manufacturer of flexible equipment, announces the removal of its executive and sales offices and production facilities to new headquarters at 217 Hudson St., Hoboken, N. J.

New York

WILLIAM J. WEAVER, since 1942 vice-president in charge of operations of the Ansonia Electrical Co., subsidiary of Noma Electric Corporation, 55 W. 13th St., New York City, has been elected president. Prior to his connection with the company, he was associated with the Bryant Electrical Co., a subsidiary of the Westinghouse Electric Corporation, for twenty years.

JEWEL TOOL CO., 125-07 101st Ave., Richmond Hill, N. Y., is a new concern organized to manufacture and market a new patented quadruple key which is capable of fitting four sizes of socket-head and hollow-head screws. The concern was organized by JOSEPH F. PATTEN and LAWRENCE A. FEIRBERG, who were formerly in the armed services.

HILL ACME CO., Cleveland, Ohio, has appointed GIEBEL, INC., 250 W. 57th St., New York City, and 152 Temple St., New Haven, Conn., exclusive representative for the sale of Hill open-side hydraulic surface grinders in the northern half of New Jersey, the eastern section of New York State, and the entire state of Connecticut.

AIR REDUCTION CO., 60 E. 42nd St., New York 17, N. Y., announces the organization of a new technical sales division to replace the former applied engineering department. The new division is headed by GEORGE V. SLOTTMAN, who has been with the company ten years. S. D. BAUMER and E. V. DAVID will be assistant managers.



George V. Slottman, Head of New Technical Sales Division, Air Reduction Co.

FREDERICK H. NEUHARDT, formerly with the General Electric Co., Schenectady, N. Y., has joined the Eastern Metal Products Co., Tuckahoe, N. Y., as sales manager of the Industrial Division. The company has recently increased its capacity for molding aluminum and other non-ferrous materials.

C. G. POMMER has been appointed manager of the Ordnance Division of the General Electric Co., Schenectady, N. Y. The name of this division has recently been changed from Ordnance Control to Ordnance Division. Mr. Pommer succeeds C. E. CLARK, who will serve as consultant to the division.

CARLOS E. HARRINGTON has been appointed chief engineer in charge of design, research, and development work for Winfield H. Smith, Inc., Springville, Erie County, N. Y., builder of speed reducers and gears. Mr. Harrington has been associated with the company for some time.

LELAND-GIFFORD Co., Worcester, Mass., TAYLOR-WINFIELD CORPORATION, Warren, Ohio, and BARBER-COLMAN Co., Rockford, Ill., have recently become members of the AMTEA CORPORATION (American Machine Tool Export Associates), 350 Fifth Ave., New York 1, N. Y.

ROLAND A. SHERWOOD has been made assistant to the president of the American Locomotive Co., 30 Church St., New York 8, N. Y. Mr. Sherwood joined the company in 1939, and became assistant to the executive vice-president last September.

C. S. MUNSON, JR., Lieutenant Commander, U.S.N.R., after four and a half years of active duty, has returned to the Vanadium Corporation of America, 420 Lexington Ave., New York, in the capacity of assistant to general manager of sales.

J. ROBERT KELLEY has been appointed executive vice-president of Manning, Maxwell & Moore, Inc., Chrysler Bldg., New York 17, N. Y. Mr. Kelley has been connected with the company since 1930, and has held various important executive posts.

H. G. LEMAIRE, formerly area superintendent of the Willow Run Division of the Ford Motor Co., has been appointed production manager of the L. C. Smith Gun Co., Inc., a division of the Marlin Firearms Co., Fulton, N. Y.

FRED J. TOBIAS has recently joined Advance Pressure Castings, Inc., 894 Manhattan Ave., Brooklyn 22, N. Y., and will take charge of production and metallurgy.

HOLBROOK L. HORTON, associate editor of MACHINERY, has been elected chairman of the Greater New York Chapter of the American Society of Tool Engineers for 1946.

AMERICAN BRAKE SHOE CO., 230 Park Ave., New York 17, N. Y., announces that

the name of its abrasion-resistant material ABK Ni-Hard alloy has been shortened to ABK metal.

LEWIS A. JONES, who recently joined the Allied Control Co., Inc., 2 East End Ave., New York 21, N. Y., has been elected a vice-president of the company.

Ohio

DONALD H. GILMORE has joined the magnesium sales staff of the Dow Chemical Co., at Cleveland, Ohio. FRANCIS T. FURMAN has been transferred from the Midland, Mich., office of the company to the New York sales office. ROBERT L. FEATHERLY, recently released from the United States Navy and formerly employed by the engineering department of the Dow Chemical Co., has returned as a member of the magnesium sales staff.

WILLIAM H. MARION has been appointed representative in northern Ohio for the PROGRESSIVE WELDER Co., Detroit 12, Mich., manufacturer of resistance welding equipment. His offices are located at 320 Ontario St., Toledo 2, Ohio. Before serving with the Procurement Division of the Army Transport Command, Mr. Marion was director of purchases for the Taylor-Winfield Corporation, Warren, Ohio.

THOMAS P. MORAN has been appointed Detroit district manager of the Precision Welder & Machine Co., Cincinnati, Ohio, with headquarters at 6432 Cass Ave., Detroit 2, Mich. The Precision Welder & Machine Co. has also appointed the WEBER-SEMMER Co., 5108 Liberty Ave., Pittsburgh 24, Pa., representative for the company in western Pennsylvania and eastern West Virginia.

LINCOLN ELECTRIC Co., Cleveland, Ohio, announces the following additions to its staff of field welding engineers: OMER W. BLODGETT, Grand Rapids, Mich.; FRANK BOUCHER, Detroit, Mich.; R. K. KEWLEY, Cleveland, Ohio; G. B. MOSELEY, St. Louis, Mo.; CAPTAIN L. J. COGAN, recently released from the United States Army, Philadelphia, Pa.

HARRY D. FRANKLIN has been appointed executive vice-president in charge of operations of SMITH & MILLS Co., Cincinnati, Ohio, manufacturer of crank shapers, control of which has recently been acquired by HARRIS-KARP-GOLDSMITH & Co., of Cincinnati, who also operate the Hiscy-Wolf Machine Tool Co.

SUTTON TOOL Co., Sturgis, Mich., manufacturer of collets, feeders, and automatic screw machine accessories, has appointed the COLLIER Co., 8015 Carnegie Ave., Cleveland 3, Ohio, sales and engineering representative of the company in northern Ohio.

COLD METAL PRODUCTS Co., Youngstown, Ohio, manufacturer of precision cold-rolled strip steel, announces the election

of the following officers: L. A. BEEGLY, chairman of the board; W. B. LOCKWOOD, president; and C. M. BEEGLY, vice-president.

SIDNEY R. BEST has been appointed advertising manager of the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio, succeeding WALTER L. RYBOLT. Mr. Best recently returned from three and one-half years of service with the U. S. Navy.

H. W. DEUKER has been promoted to the position of works manager of the Cincinnati plants of the manufacturing division of the Crosley Corporation. He previously held the position of director of quality.

GEORGE W. VEALE, a vice-president of the Eaton Mfg. Co., Cleveland, Ohio, has been appointed general manager of the company's Axle Division. He has been associated with the company since 1920.

HAROLD R. EICHER, formerly assistant to the president of the Master Electric Co., Dayton, Ohio, has been appointed sales manager of the Industrial Equipment Division of the company.

LEMPCO INTERNATIONAL, INC., Citizens Bldg., Cleveland 14, Ohio, has been appointed representative of the LOVEJOY TOOL Co., Inc., Springfield, Vt., in foreign markets.

C. W. GINTER, who has been associated with the Aro Equipment Corporation, Bryan, Ohio, since its organization sixteen years ago, has been appointed vice-president.

EDWARD E. HELM, general sales manager of the Reliance Electric & Engineering Co., Cleveland, Ohio, has been elected sales vice-president.

Pennsylvania

GWILYM A. PRICE has been elected president of the Westinghouse Electric Corporation, Pittsburgh, Pa., succeeding GEORGE H. BUCHER, who has resigned. Under a recent amendment of the corporation's by-laws, Mr. Price, as president, will be the chief executive officer. A. W. ROBERTSON, who, as chairman of the corporation, has been chief executive officer since 1929, has reached the retirement age. He was elected chairman of the board of directors under the new by-laws, and will continue as a member of the organization in a less active capacity. Mr. Bucher was elected vice-chairman of the board of directors and will continue to serve as chairman of the Westinghouse Electric International Co. Mr. Price has been executive vice-president since May, 1945.

FRANK R. MARKLEY has been appointed general sales manager of the Sun Oil Co., 1608 Walnut St., Philadelphia 3, Pa. He was formerly manager of the company's industrial products department.

MAXIMILIAN H. LEISTER has been named general manager of the motor products department. RAY H. ANDERS will succeed Mr. Markley as manager of the industrial products department.

STERLING T. BOYD has been appointed plant metallurgist of the Colonial Steel Division of the Vanadium-Alloys Steel Co., located in Monaca, Pa. Previously, Mr. Boyd was employed as chief inspector of the company.

LIEUTENANT COLONEL CHARLES H. GREENALL, director of research at the Frankford Arsenal, has been appointed executive director of the Franklin Institute Laboratories, Philadelphia, Pa., assisting Dr. HENRY BUTLER ALLEN, who will continue to have over-all charge of the research work. Colonel Greenall will assume his new duties about April 1.

BROWN INSTRUMENT Co., Division of MINNEAPOLIS-HONEYWELL REGULATOR Co., Philadelphia, Pa., announces that it will complete this year the installation of \$500,000 worth of new manufacturing, processing, and development equipment started in 1945. About half the total amount was installed last year.

E. R. JACOBSEN has been named sales manager of the Paul and Beekman Metal Stamping Division of the Portable Products Corporation, Pittsburgh, Pa., and A. G. KOENIG has been named general sales manager of the Tagliabue Instrument Division of the company at Brooklyn, N. Y.

LIEUTENANT COLONEL HAROLD N. HILL, until recently assistant to the district chief of the Birmingham Ordnance District, Birmingham, Ala., has been appointed manager of railway sales for the Gulf Oil Corporation, Pittsburgh, Pa.

WILLIAM H. STENGER has been appointed Pittsburgh district manager of the Firth-Sterling Steel Co., McKeesport, Pa., succeeding LLOYD R. CLOWES, who was recently appointed assistant general sales manager of the company.

C. L. HARDY has been appointed manager of the Philadelphia steel-service plant of Joseph T. Ryerson & Son, Inc., succeeding JAMES M. MEAD, who becomes manager of the New York plant.

GUSTAF A. OSTROM has been appointed chief research engineer of the Alloy Rods Co., York, Pa. He was formerly a welding engineer with the Foote Mineral Co.

Wisconsin

R. H. MUNN, JR., who served as a major in the Chemical Section of the U. S. Army during the war, has been appointed manager of the Pittsburgh office of Ampco Metal, Inc., Milwaukee 4, Wis., and will act as field engineer in the Pittsburgh territory, with headquarters at 732 Frick Building, Pitts-

- No expensive trimming dies
- No tie-ups of press time

with this

FAST, ACCURATE WAY TO TRIM AND FORM INTRICATE STAMPINGS

Quickwork stamping trimmers trim, form, bead, and flange complicated stampings in a matter of seconds—and do it accurately to $\pm .003$ in. Eliminating the need for expensive trimming dies and saving valuable press time, they cut production costs and speed output as well.

Handling almost any type of stamping in a single plane, Quickwork trimmers trim steel, stainless steel, and aluminum alloy stampings, with or without flash, with equal ease. Jigs or fixtures for each trimmer are specially adapted to the job, guiding even the most intricate stampings throughout the entire pass.

Check the possibilities of a Quickwork for solving *your* stamping trimming problems; write for Bulletin QW-119 today.

WHITING

CORPORATION

15673 LATHROP AVENUE, HARVEY, ILLINOIS

Export Department: 136 Liberty Street,
New York 6, N. Y.



A Quickwork stamping trimmer trimmed over 500,000 of these 14-gauge stampings accurately to $\pm .003$ ". There were no rejects.



Typical sliding supporting fixture for a special application. Stamping shown is for a water cooler cabinet top.



The same stamping positioned for trimming. Quickwork cutters are also specially adapted to the job.

burgh 19, Pa. W. J. NEBEL has assumed the duties of field engineer in the Newark, N. J., district, with headquarters at the company's offices at 1060 Broad St.

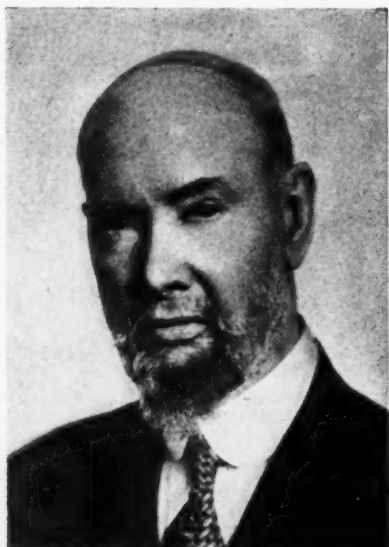
GIDDINGS & LEWIS MACHINE TOOL CO., Fond du Lac, Wis., manufacturer of horizontal boring, drilling, and milling machines, announces that it has acquired the DAVIS BORING TOOL DIVISION of the LARKIN PACKER CO., INC., St. Louis, Mo.

ARTHUR A. LADWIG has been appointed vice-president in charge of manufacturing of the Le Roi Co., Milwaukee, Wis., manufacturer of engines, air compressors, generator sets, etc. He has been connected with the company since 1923, and previous to his present appointment was works manager.

Obituaries

Elmer H. Neff

Elmer H. Neff, head of the New York office of the Brown & Sharpe Mfg. Co., Providence, R. I., for forty years, died at his home in Upper Montclair, N. J., on January 26. Mr. Neff was born in Vienna, Mich., on March 6, 1866. He was a graduate of the University of Michigan and a nationally known mechanical engineer. Previous to entering the employ of the Brown & Sharpe Mfg. Co. in 1896 as a designer, he had worked in various capacities in several plants in the West. In 1897, he was made manager of the firm's New York office, which position he held until his retirement in 1937, although he continued to serve in an advisory capacity until the time of his death. In addition to being a life member of the American Society of Mechanical Engineers, he was a member of the Railroad Machinery Club of New York. Two daughters survive him.



Elmer H. Neff

Coming Events

MARCH 20-22—Production Show at the Stevens Hotel in Chicago, Ill., sponsored by the Chicago Technical Societies Council. Executive secretary, Paul A. Jenkins, 53 W. Jackson Blvd., Chicago 4, Ill.

MARCH 29-30—AMERICAN GAS ASSOCIATION CONFERENCE ON INDUSTRIAL AND COMMERCIAL GAS at the Commodore Perry Hotel, Toledo, Ohio. For further information, address American Gas Association, 420 Lexington Ave., New York 17, N. Y.

APRIL 1-4 — Spring meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Chattanooga, Tenn. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

APRIL 2-5—PACKAGING EXPOSITION in the Public Auditorium, Atlantic City, N. J., under the auspices of the American Management Association. Further information can be obtained from the American Management Association, 330 W. 42nd St., New York City.

APRIL 3-5—National Aeronautical meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at the Hotel New Yorker, New York City. Secretary and general manager, John A. C. Warner, 29 W. 39th St., New York 18, N. Y.

APRIL 8-12—Annual meeting of the AMERICAN SOCIETY OF TOOL ENGINEERS, and Exposition under the auspices of the Society, in Cleveland, Ohio. For further information, address executive secretary, Harry E. Conrad, 1666 Penobscot Bldg., Detroit, Mich.

APRIL 9-10—Tenth annual ELECTRIFICATION FORUM to be held at the William Penn Hotel, Pittsburgh, Pa., under the sponsorship of the Westinghouse Electric Corporation, Pittsburgh 30, Pa.

APRIL 22-27—NATIONAL PLASTICS EXPOSITION in Grand Central Palace, New York City, under the sponsorship of the Society of the Plastics Industry, 295 Madison Ave., New York 17, N. Y., who will hold a convention concurrently with the exposition.

JUNE 2-7 — Summer meeting of the SOCIETY OF AUTOMOTIVE ENGINEERS at French Lick Springs Hotel, French Lick Springs, Ind. John A. C. Warner, secretary and general manager, 29 W. 39th St., New York 18, N. Y.

JUNE 3-6—Aviation Division Meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Los Angeles, Calif. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 12-15—Oil and Gas Power meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Milwaukee, Wis.

Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 17-20—Semi-annual meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Detroit, Mich. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 20-22 — Conference of the NATIONAL INDUSTRIAL ADVERTISERS ASSOCIATION at Atlantic City. For further information, address W. Lane Witt, president and general manager of the National Industrial Advertisers Association, 100 E. Ohio St., Chicago 11, Ill.

JUNE 21-22—Applied Mechanics meeting of the AMERICAN SOCIETY OF MECHANICAL ENGINEERS at Buffalo, N. Y. Clarence E. Davies, secretary, 29 W. 39th St., New York 18, N. Y.

JUNE 24-28—Forty-ninth annual meeting of the AMERICAN SOCIETY FOR TESTING MATERIALS at the Hotel Statler, Buffalo, N. Y., in conjunction with the seventh exhibit of testing apparatus and related equipment. Additional information can be obtained from C. L. Warwick, executive secretary, 260 S. Broad St., Philadelphia 2, Pa.

SEPTEMBER 16-20—1946 Exhibit and conference of the INSTRUMENT SOCIETY OF AMERICA at the William Penn Hotel in Pittsburgh, Pa.

* * *

Warner & Swasey Adds Road Machinery to Its Line

The Warner & Swasey Co., Cleveland machine tool builder, is entering the road machinery field with the manufacture and sale of a new grading machine known as the "Gradall." The machine, which is of a design that permits earth-moving in places not ordinarily accessible to previous types of excavating equipment, was invented by Ray Ferwerda, a Cleveland contractor, and the Warner & Swasey Co. is licensed to build the machine under his patents. The machine is hydraulically operated and has an expandable 24-foot boom of arc-welded construction.

* * *

Simonds Companies Adopt New Trademark

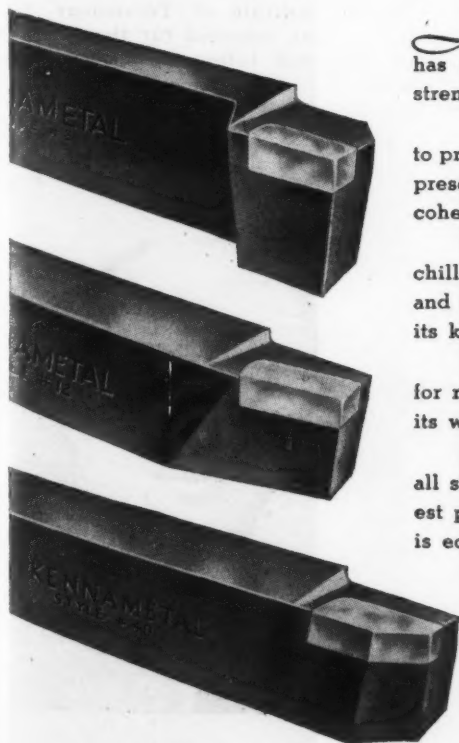
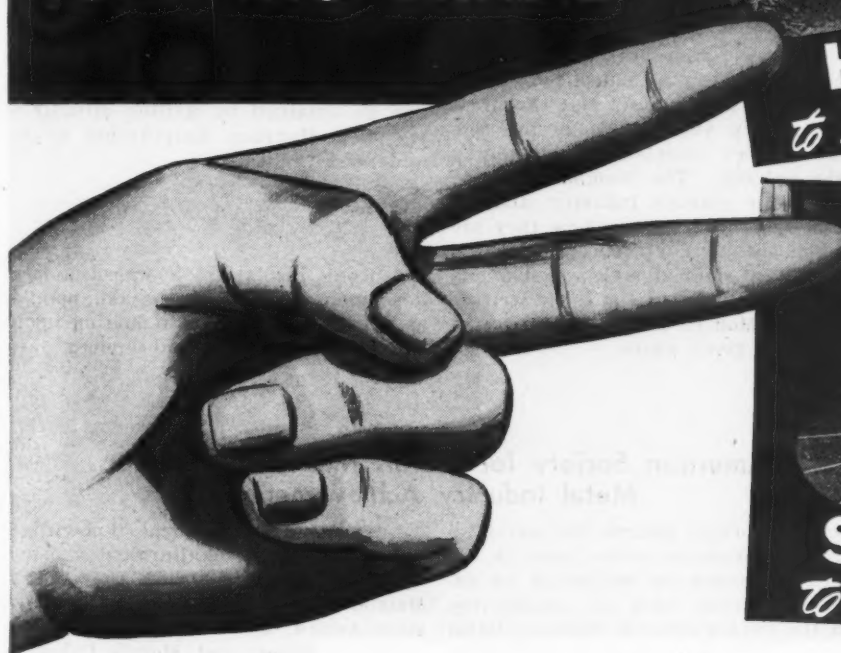
A new trademark recently designed by the Simonds Saw & Steel Co. and its affiliated companies—Simonds Canada Saw Co., Ltd.; Simonds Steel Mills, Lockport, N. Y.; and Simonds Abrasive Co., Philadelphia, Pa.—is basically the same for all four companies, the only variance being in the name of the company. Of considerable interest is the fact that the Simonds Saw & Steel Co. has been a foremost producer of "cutting edges" for over 114 years; its founder, Abel Simonds, began the manufacture of scythes in 1832.

KENNAMETAL K6...

The 2 in 1
**CAST IRON
CUTTING GRADE**

HARDNESS
to resist ABRASION...

STRENGTH
to resist SHOCK...



In providing a carbide for cast iron jobs involving rough or interrupted cuts it has usually been considered necessary to sacrifice some hardness for the sake of strength, with consequent shortening of tool life.

This is no longer necessary. Metallurgists of Kennametal Inc. have found a way to produce a 2 in 1 composition. It is hard *and* strong. These characteristics are both present to a high degree in Kennametal K6 grade, because of its uniform, strongly-coherent structure.

It has ample strength to withstand the shock of machining rough, sandy, or chilled castings, even though they are out of round, or have surface interruptions—and at the same time it has sufficient hardness to effectively resist abrasion, and hold its keen edge for a remarkably long time.

This new and improved tungsten carbide can be used with entire satisfaction for roughing, finishing, and precision boring. Scores of cases on record demonstrate its widespread effectiveness.

K6 blanks, and complete single point tools, are now available from stock in all standard styles and sizes. Use them on cast iron machining jobs to assure highest production with lowest tool cost. Remember also, that this grade of Kennametal is equally effective on milling—which is essentially interrupted cutting.



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New Books and Publications

FIFTY LESSONS IN ARC WELDING. 115 pages, 8 1/4 by 10 3/4 inches. Published by the Westinghouse Electric Corporation, East Pittsburgh, Pa. Price, 50 cents.

This little instruction book contains a course of training designed to give the beginner the necessary shop experience so that he will become familiar with the elementary details of welding and obtain the necessary experience to become an arc-welding operator. The book is a revision of the original Westinghouse training course entitled "41 Lessons in Arc Welding." The course covers welding with alternating- and direct-current welders in all positions, with three types of heavily covered welding electrodes. It also includes fillet and groove welds. Test exercises are given to check the student's ability.

INDUSTRIAL TRAINING AND TESTING. By Howard K. Morgan. 225 pages, 6 by 9 inches. Published by the McGraw-Hill Book Co., Inc., 330 W. 42nd St., New York 18, N. Y. Price, \$2.50.

This book describes a complete plan for an industrial training system, including the organization of the training department. It gives a comprehensive survey of methods and costs involved in the selection of a suitable worker, and shows how to test new employees simply and effectively. Instruction methods are covered for the major divisions of industrial training, including sales, service, supervisory, instructor, introductory, and shop courses. A complete follow-up record and evaluation system for employees is included.

NEGATIVE-RAKE MILLING. 60 pages, 5 1/2 by 8 1/2 inches. Published by the Machinery Publishing Co., Ltd., 17 Marine Parade, Brighton 1, England. Price, 3/6d.

This booklet describes the new technique for high-rate production known as "negative-rake milling" and gives examples of the application of this method of milling in two airplane plants in the United States. The results of development work carried out by a large English plant are also recorded. A chapter is included on turning with negative-rake lathe tools.

* * *

Plastics Guide

A consumer guide entitled "Everyday Plastics" has been published by Modern Plastics, 122 E. 42nd St., New York 17, N. Y., with a view to giving the consumer a more complete understanding of the subject. The booklet tells the story of the plastics industry, and describes what plastics are, how they are made, and what they can be used for in simple, non-technical style. Consumers of plastics can obtain copies by writing directly to Modern Plastics magazine at the address given above.

* * *

Demonstration Rooms for Grinding and Polishing

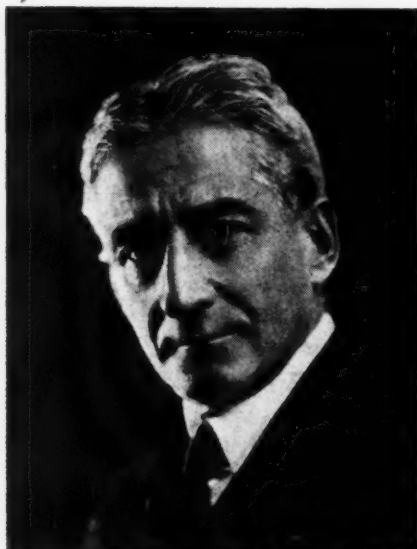
The Behr-Manning Corporation, Division of Norton Co., Troy, N. Y., has established a new service in the coated abrasives industry—namely the provision of methods and equipment demonstration rooms for the use of customers in pretesting their grinding, sanding, and finishing tools-ups on standard commercial equipment without disturbing their plant production schedules. These demonstration rooms are being opened at various branches of the company, including Philadelphia, High Point, Los Angeles, New York, and Cincinnati. Plans are under way for installations in other branches of the company when floor space and equipment become available. Full details concerning this service are published in a bulletin entitled "Your New Laboratory, Sir!", which can be obtained by writing directly to the Behr-Manning Corporation at the address given above.

Silicone insulation, a war-stimulated development, is said to make possible as much as 50 per cent reduction in the weight of many electrical devices.

American Society for Metals Makes Awards for Metal Industry Achievements

Four important awards for metal industry achievements were made by the American Society for Metals at its annual convention, held in conjunction with the twenty-seventh National Metal Congress and Exposition in Cleveland on February 4 to 8. Gerard Swope, honorary president of the General Electric Co., received the A.S.M. Gold Medal for advancement of research; Earle C. Smith, chief metallurgist of the Republic Steel Corporation, the Gold Medal for

outstanding metallurgical knowledge; Robert S. Archer, metallurgical assistant to the vice-president of the Climax Molybdenum Co., the Sauveur Achievement Award; and Dara P. Antia, Stewart G. Fletcher, and Morris Cohen of the Department of Metallurgy, Massachusetts Institute of Technology, the Howe Medal, awarded for the best paper presented before the Society and published during the past year in the Transactions of the Society.



Gerard Swope



Earle C. Smith



Robert S. Archer

How **POST-WAR** **MACHINE TOOLS** will get their—



Many major producers are using **CONE-DRIVE** gearing to obtain these three attributes in machines designed for Post-War use. The story is told in a new booklet now available from the **CONE-DRIVE DIVISION**.

The reasons so many machine tool manufacturers are turning to **CONE-DRIVE** gearing are inherent in that gearing itself:

1. Large actual area contact between gear teeth and more teeth in contact, resulting in vastly higher load carrying capacity and smoother power flow.
2. Ability to generate gears that have the exact amount of backlash desired.
3. Ability to resist wear. **CONE-DRIVES** tend to wear "in" instead of "out". They actually become *quieter with use*.
4. Greater compactness by virtue of the greater load carrying capacity for a given size.

We will be glad to send you a copy of this booklet. Ask for Bulletin #632—**CONE-DRIVES IN MACHINE TOOLS**

SPEED
POWER
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CONE-DRIVE DIVISION

MICHIGAN TOOL COMPANY
7171 E. McNichols Road, Detroit 12, U.S.A.

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